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On the Art of the Liquorist.

[Translated from the *Dictionnaire Technologique*, for the Technological Repository.]

The term *liquorist*, is given to the preparer of *liqueurs* for the table, and which are composed of alcohol, water, sugar, and different aromatic ingredients. Since the valuable discovery in distillation, made by Edward Adam, a total change of system has been effected in the manipulation of the distillers of brandy and other spirits; and the liquorist now assumes the title of *distillateur-liquorist*, because he is necessitated to re-distil brandy, in order to transform it into spirits fit for his purpose. Whereas, formerly, the distiller always furnished the rectified alcohol to the liquorist. We shall now proceed to give the necessary information, to enable persons to obtain excellent products.

The liquorist extracts the perfumes from the various aromatics which he employs: first, by infusion, and then by distillation. The liquor in which he infuses them, varies according to their nature; but it is the alcohol known in commerce, under the name of *thirty-six and a half* degrees*, which he employs; and either pure, or mixed with an equal measure of river water, or other pure water, when it is termed alcohol of eighteen degrees.

Infusions of fruits or rinds.—With a very sharp knife, he peels off the outside rinds, in thin morsels, in order that they may the more readily yield the essential oils which they contain. These are let fall into a glazed earthen vessel, containing alcohol of 36°, di-

* Of Beaume's Areometer, equal to about 0.8500 specific gravity.

luted with an equal volume of water, and which must, afterwards, be securely closed; but when he would employ the fruits themselves, he puts them into large bottles, made of white glass, and which must also be well closed. In either of these modes, he thus prepares the infusions of citrons, oranges, lemons, shaddocks, *bergamottes*, &c. These are left to infuse during six weeks, frequently shaking the vessels from time to time, and are finally distilled.

Infusions of seeds.—The aromatic seeds, after being previously bruised or pounded, must be put into large glass bottles, well closed, together with alcohol, diluted with an equal portion of water; they must be shook up from time to time, during the space of six weeks, and be then distilled. In this manner the seeds of fennel, anise, cloves, dill, &c. are prepared. But as the seeds of celery, and angelica, contain an essential oil, which is too acrid when prepared in the above manner; so they employ the stems of those plants instead thereof.

Infusions of aromatic woods.—These are either to be pounded, or to be cut into minute portions; and they add a few drops of water to them, whilst pounding them, to retain them the better under the pestle. These are to be infused and distilled, in the same manner as the seeds.

Solutions of aromatic resins.—Myrrh, aloes, storax, and others, which form the bases of elixirs, likewise enter, in small quantities, into the composition of certain *liqueurs*, when dissolved in pure alcohol of 36°. These solutions should not, however, be more than slightly charged therewith, lest they become too acrid.

It is easy to conceive that the warehouse of the liquorist should be furnished with proper shelves, &c., on which the vessels which contain the great number of various infusions he requires, should be placed always ready for use. Each of the vessels should bear a label, indicating the nature of the infusion which it contains; and also whether the infusion has been made with alcohol alone, with the diluted alcohol, or with water only, as is the case with flowers, before submitting them to distillation. When the maceration has been sufficiently prolonged, we proceed to a careful distillation. The products of each distillation must be likewise preserved in similar large and well closed bottles, and bear the name of *spirit*, as *spirit of citron*, *spirit of aniseed*, &c.

The liquorist who is anxious to manufacture excellent *liqueurs*, never adds the colouring materials to them, until six months has elapsed after their distillation. He suffers that time to elapse, in order that the perfumes may be well combined with the alcohol. If, nevertheless, he is obliged to employ them in a short time afterwards, as, in the course of a few days for instance, he then takes care to shake up the vessels more frequently every day, in order to hasten their combination.

On the composition of liqueurs.—The *liqueurs* are designated by different names, according to the manner in which they have been manufactured. They are thus termed *waters*, *creams*, or *oils*. The *waters* are those *liqueurs*, which do not present any viscosity to the

taste. The *creams*, or *oils*, appear to possess those properties, on account of an agreeable species of viscosity which they afford in the mouth. The same *liqueur* may be made to possess either the first quality or the second, at will, by merely changing the proportions of the perfumes, or other ingredients employed. An example or two will enable us to understand the difference.

Cedrat-water.—Three kilograms of white sugar are to be dissolved in eight litres of river water; then add two litres of *spirit of cedrat*, and one litre of *spirit of citron;* make the whole boil for a minute, and filter it, while hot, through a straining-bag (*chausse;*) receive the liquor into a vessel of earthenware, and change the vessel as soon as it no longer passes clear. When it becomes cold, put it into large bottles, and do not open them until a considerable time afterwards.

Oil or cream of cedrat.—Eight litres of river water, two litres of *spirit of cedrat*, and add as much sirop of sugar as will soften the *liqueur* to the necessary degree, to give it a clammy consistence; then agitate or stir it well with a *spatula*, to make the combination perfect, and put it into bottles, which must remain for a considerable length of time unopened. If the *liqueur* should become a little turbid, it must be filtered through paper, or better through a filter made of fustian, suspended in a funnel of tinned sheet iron, closed by a moveable cover.

We see, by these two examples, that the difference between the *waters* and the *oils*, consists in employing more or less sugar. When we use the sugar in its entire state, and but in small quantity, we form the *waters;* but when we employ it in the state of sirop, and increase the proportion of it, we obtain a viscous *liqueur*, and which appears oily both to the sight and taste.

Our limits will not permit us to give recipes for making all the kinds of *liqueurs;* but they may be found in several works which treat on the art of the liquorist; we shall merely give the leading outlines of this art.

The perfection of the liquorist's art, consists in his thoroughly studying the nature of the perfumes which he employs, and in making his mixtures thereof according to the proportions which are best fitted to develop the principal flavour which should predominate in the *liqueur*, but avoiding all acridity; and also in employing with prudence and good management, those other substances, which, without being distinguished by their peculiar tastes, are, nevertheless, necessary to strengthen that particular perfume which we have a view in employing. The *liquorist* ought, therefore, to possess a most delicate taste; he ought also to know, at least, as much of chemistry as should prevent him from hazarding the mixing of those substances together, which, by decomposing each other, would afford results the most contrary to those he is endeavouring to obtain. He ought, likewise, to thoroughly understand the principles and the practice of distillation, as well as to be able to prepare his spirits, and the plants, flowers, roots, woods, &c., and to extract their perfumes, and which he must employ every instant in his business.

The art of the *liquorist* is one of the most important applications of chemistry; and one, which those who are but little versed in this science, can have but small hopes of carrying to that degree of perfection of which it is susceptible. Before chemistry had made such progress, the *liquorist's* art was an empiric one, and every thing was done at hazard. Formerly, whenever any one fortunately happened to compose a *liqueur*, which pleased both the taste and smell, he was praised up to the skies; and every one endeavoured either to obtain his recipe, or to imitate the *liqueur*. Now, since we have studied the true methods of operating, we work with greater ease, and more economy; and obtain results which are more pleasing to the taste, as well as much more wholesome.

We shall now give the recipes for several new *liqueurs*, which have never before appeared in print; and are, indeed, the results of our own experiments. We are convinced, that by following the processes, excellent *liqueurs* may be made by infusion; and to which the properties, either of an oil or a cream, may be given with facility.

No. 1. *Baume des Moluques.*—We infuse for ten days, in a stone or glass vessel, capable of holding twenty kilogrammes of water, five kilogrammes of brandy, at eighteen degrees, two kilogrammes of white sugar, two kilogrammes of river water, fifteen grammes (four gros) of cinnamon, in powder, fifteen grammes (four gros) of cloves, powdered, and three grammes (forty-eight grains) of mace, bruised. The whole must be shaken, or stirred up, three times a day; and a brown colour is to be given to it by caramel (burned sugar.) At the end of the ten days it must be filtered, and put into closed bottles.

No. 2. *Larmes des veuves du Malabar.*—The same quantities of brandy, sugar, and water, as in No. 1; to which we add fifteen grammes (four gros) of powdered cinnamon, three grammes (forty-eight grains) of bruised cloves, and the same quantity of mace. This must be slightly coloured with caramel.

No. 3. *Les délices du Mandarin.*—Brandy, sugar, and river water, in the same proportion as in No. 1; and either add fifteen grammes (four gros) of starry aniseed (*badiani*) or of *ambrette* (*hibiscus abelmoschus, L.*) in powder; and also seven or eight grammes (two gros) of *carthamus*, or bastard saffron.

N. B. We must take care in giving a gold colour to this *liqueur* with the bastard saffron, as its smell resembles that of honey, which smell it may also communicate to the *liqueur*, and render it disagreeable.

No. 4. *Les soupirs de l'amour.*—Brandy, sugar, and rain water, in similar proportions with No. 1. But we perfume it with the essence of roses, of which we add a sufficient quantity to give it the required scent. A pale rose colour is given to it by the tincture of cochineal, as we shall describe below. It must be filtered when the sugar is dissolved; after which, it must be well stirred up five or six times, and then be put into well stopped bottles.

We can also make this *liqueur* without employing the essence of roses, as follows:—five kilogrammes of brandy, at eighteen degrees;

two kilogrammes of white sugar; of rose water, distilled in the manner hereafter described, a sufficient quantity to give it a fine perfume. If the *liqueur* should prove too weak, more brandy must be added to it, of thirty-six degrees; but if it be too strong, dilute it with rain water; and if it has not a sufficient consistence, add sirop to it.

The rose water which we recommend, is made in the following manner:—we place in the body of a still, a layer of rose leaves, then another of powdered kitchen salt, then another layer of rose leaves, and another of salt upon that; and so on, up to the neck of the still, observing that the last layer is a slight one of salt. We then fill the body with water, and proceed to distillation. The first distilled products are to be re-passed a second and a third time, upon new rose leaves, arranged as in the first distillation, with salt between the layers. After three distillations, the rose water will be perfect.

No. 5. *Crème de macarons.*—Brandy, sugar, and rain water as in No. 1; to which we add 245 grammes (demilivre) of bitter almonds, peeled and well bruised; cloves, cinnamon, and mace, also bruised, of each three grammes (forty-eight grains.) Or we may substitute for the bitter almonds, the kernels of peaches or apricots, should they be thought too acrid.

This *liqueur* is made of a purplish, or violet colour, with a decoction of litmus, to which is added prepared cochineal, to give it a fine tint.

No. 6. *Curacao.*—We put into a large bottle, nearly filled with alcohol, at thirty-four degrees of Baume (or thirty-six) the peels of six fine Portugal oranges, which are smooth skinned, and let them infuse for fifteen days. At the end of this time, we put into a large stone, or glass vessel, five kilogrammes of brandy, at eighteen degrees, two kilogrammes of white sugar, and two kilogrammes of river water. When the sugar is dissolved, we add a sufficient quantity of the above infusion of orange peels, to give it a predominant flavour; and we aromatize it with three grammes of fine cinnamon, and as much mace, both well bruised. Lastly, we throw into the *liqueur*, thirty-one grammes (one ounce) of Brazil wood, in powder. The whole is left in infusion ten days, being stirred three or four times a day. At the end of this time, we taste the *liqueur;* if it be too strong and sweet, we add more water to it; if too weak, we add alcohol, at 36°; and if it be not sweet enough, we put sirop to it. We also give it colour with caramel, when we would tinge it.

No. 7. *Extrait d'absinthe de Suisse.*—Many persons have inquired for the composition of this *liqueur;* we trust that we shall give them a gratification in communicating a recipe given us by the late Cadet Gassicourt, who brought it from Switzerland.

"The distillers of Geneva, Basle, Zurich, Neuchâtel, Berne, and Lausanne, make a great trade in an alcoholic *liqueur*, aromatized by wormwood and aniseed, and marking about twenty-four degrees of Baume's areometer. This *liqueur*, which is called *extract of wormwood*, is composed in the following manner:

Summits of the greater wormwood,		2 kilogrammes.
——— of the lesser	ditto,	1
Angelica roots, *Calamus aromaticus*,	of each	0,122 grammes.
Seeds of the starry aniseed (*badiane*,)		0,061
Leaves of the dittany of Crete,		0,031
Alcohol, at 20 degrees,		18 kilogrammes.

"These substances are infused for eight days: they are then distilled over a gentle fire, and we draw off nine kilogrammes of spirit, to which we add eight grammes (two gros) of the essential oil of green aniseed. The nine kilogrammes which remain in the alembic, serve for the preparation of a vulnerary spirit."

Most of the manufacturers colour their extract of wormwood, either with the expressed juices of smallage, or of spinach. This colour is very fine at first, but the light destroys it. Nevertheless, as a green colour is pleasing amongst the *liqueurs* at table, such as those of wormwood, mint, emerald water, &c., so we indicate a process by which we can obtain all the tints of green, and which are, likewise, durable.

On colouring liqueurs.—We ordinarily colour *liqueurs* yellow, fawn colour, red, violet, or green. The object is to employ permanent colours, which shall not be prejudicial to health.

Yellow.—The *safranum*, or *carthamus tinctorius*, contains two colouring parts, yellow and red: the first, the yellow, is soluble in water only, and is that with which we are at present occupied. In order to tinge *liqueurs* yellow, we infuse the petals of this flower in them, in a greater or less quantity, as we would have the yellow lighter or deeper.

Fawn colour.—The caramel gives a fawn colour more or less deep. To prepare it, we take an iron ladle, which is very clean, and put into it powdered white sugar, and place it over a stove; the sugar melts, and must be constantly stirred until it takes a perfectly equal brown colour; but we must take great care that it is not burnt. When it has attained the desired colour, we must throw water into it, and stir it up well; it will dissolve entirely, and yield a colour more or less deep, as more or less of it is employed.

Red.—Cochineal affords all the shades of red, accordingly as it is used in greater or less quantities; but the process for preparing it is always the same. We bruise the cochineal in a mortar, adding to it a sixth part of alum in powder: when these two substances are well pulverized, we pour boiling water upon them, and mix them well together with the pestle; we throw this colour into the *liqueur*, after previously passing it through a filter.

Violet.—Litmus yields a violet-colour; we reduce the lumps of this material to a subtle powder, in a mortar, and pour boiling water upon it: we add this mixture to the *liqueur*, until it is coloured to the requisite degree, and finally filter it.

Blue and green.—Indigo dissolved in the sulphuric acid, affords a permanent blue colour. We take indigo in powder, and grind it up with a small quantity of water in a glass mortar, with a pestle

of the same material; on this we pour, from time to time, a little concentrated sulphuric acid, at 66°, or until the indigo appears to be entirely dissolved. We then add to the solution, carbonate of lime in powder, which neutralizes the sulphuric acid, forming with it sulphate of lime, which precipitates. We then treat the mixture with alcohol, which becomes charged with the blue colouring matter of the indigo. After filtering it and mixing it with the yellow of carthamus, we obtain all the varieties of green which we can possibly desire. This preparation is not injurious to the health, nor does it change the flavours of the *liqueurs* which are coloured by it. The confectioners use it also to tinge their green sweetmeats with.

The liquorist also makes the artificial wines, or ratafias, in which he employs all kinds of fruit, such as oranges, peaches, apricots, cherries, raspberries, strawberries, mulberries, &c. He takes these fruits, when they are perfectly ripe, and expresses their juices, which he suffers to rest for twenty-four hours, and then passes it through a linen cloth. In each *litre* of juice, he dissolves 245 grammes (eight ounces) of white sugar, and then adds alcohol of 36°, until it has sufficient strength. He leaves the whole to macerate during fifteen days; filters it, and puts it up into bottles. These wines, or ratifias, were greatly used formerly.

Many liquorists, also, prepare the waters for the use of the toilette; but these more properly belong to the art of the perfumer. L.

On the Mordants used in Dying, Calico Printing, &c.

[Translated from the *Dictionnaire Technologique*, for the Technological Repository.]

This term is used in many of the arts, to designate the agglutinating substances; which cause, by their application to different surfaces, the adherence of certain bodies to them. This is the term which is given in the art of carving and gilding, to the kind of varnish, or size, which serves to cause the leaves of gold or silver, to adhere to the work. In other arts, on the contrary, they call *mordants* the acid agents, by the aid of which they attack or corrode the surfaces of metals, in order to clean them. But in dying and calico printing, they attribute to the same word another meaning. It is chiefly used to describe those bodies which possess the double property of intimately combining with the organic fibres of the materials to be dyed or printed, and the colouring matters, from whence there results a triple combination, the mordant serving as the common bond of union between the colouring materials employed, and the tissue; so that their union is more intimate, and the dyes are, consequently, less perishable.

Such is the use of the mordants which form one of the principal bases of the arts of dying and calico printing. We shall now enter into farther particulars, by which we shall render their importance better understood.

In order to perfectly appreciate the utility of mordants, and their true functions, we must premise, that the colouring materials generally contain principles *sui generis*, and which possess particular affinities. Their distinctive characters in general, are, that they are neither acid nor alkaline; and yet, nevertheless, have the power of combining with certain bodies, and more particularly with their bases, and receive from each, modifications in their colour, their solubility, and their changeability. The pure organic colouring materials possess a very energetic affinity for certain bodies, a weak one for others, and nearly none at all for some. Amongst these primitive materials, some are soluble in pure water, whilst others can only be employed through the agency of particular substances. We may then conceive, after what has been stated, that amongst them all, a colouring substance may possess a certain affinity for the organic fibres, so as to be fixed or dyed with the mediation of mordants; and also that it may be insoluble in water; and, in fact, this is the case with the colouring matter of carthamus, annatto, and indigo. The two first are soluble in alkalies. It is sufficient, therefore, in applying them to dye cloth, to make a solution of them in an alkalized water, to plunge the cloth to be dyed into it; and to precipitate the dying material, by saturating the alkali in the solution, by means of an acid. The colouring matter, at the moment when it is separated from its solvent, is in a state of great division; and is brought into contact with the organic fibres, with which it has a certain affinity. It is thus intimately united with them; and, as it is naturally insoluble in water, or, as we may say, has no affinity for this vehicle, so any subsequent washings will not discharge the dye. It is not exactly the same with indigo, as its solubility in the dying bath does not depend upon a similar cause, but upon a change in its constituent principles. It is, however, certain, that after having been subjected to this modification, it becomes soluble in the alkalies; and when the cloths are plunged into a bath, impregnated with this solution, and are exposed to the air, the dying matter at once resumes its colour, and its original insolubility; and which subsequent washings cannot deprive of more than the superabundant portions remaining after the combination is effected; and which portions were merely deposited upon the cloth.

Thus we see, that it may happen, that the insoluble colouring matters which exist, together with those which possess more or less solubility, may not possess such an affinity for the organic fibres, as that the combination formed between them should be firm; but that water has an affinity for the colouring matter which balances, and frequently exceeds, that which it has for the cloth.

In this case, the dyers are obliged to have recourse to intermediate bodies, which may add their proper affinity for the colouring matters, to that which they possess for the organic molecules of the cloth; and thus augment by this double action, the intimacy and the stability of the combination. These are the intermediate bodies which have received, as we have before mentioned, the name of *mordants*.

The mordants are, in general, taken from amongst the bases, and the metallic oxides, and it would appear, at the first glance, that there exists a great number of them; but when we see that they must combine the double condition of possessing a strong affinity, both for the colouring matters, and for the organic fibres; and if, above all, we reflect that the insoluble bases are few, which possess the power of forming insoluble combinations, we shall perceive that their number is singularly limited. We know, in fact, that lime and magnesia, for example, possess a great affinity for colouring matters, and are capable of forming insoluble combinations with them; and they are generally employed as mordants, because they likewise possess an affinity for the organic fibres of the cloth.

Experience has shown, that of all the bases, those which succeed best as mordants, are alumine, tin, and the oxides of iron; and, also, that as the two first are naturally white, so they are the only ones which are fit to be employed when we would preserve the dying material of its original colour. On the contrary, if the mordant were coloured, we may conceive that there will, necessarily, be produced a colour entirely different from the primitive one.

If, as we have above said, the mordant forms a true combination with the cloth to be dyed, it results that the application of it should also be made under those circumstances which are the most capable of favouring the combination; and this, in fact, is daily practised in the dye-houses. We shall now enter into some details in this respect.

In order that a combination may be properly effected, it is in general necessary, not only that the bodies which are to be brought into contact should be in a state of liberty, or, at least, as nearly in that state as possible, but it is also known that the combination is best effected when the molecules are in the greatest state of division. As the mordants which act so as to combine with the tissue, are, as we have before said, insoluble by themselves, so we are obliged, in order to divide their molecules, to dissolve them in an appropriate vehicle: but this solvent also necessarily possesses, on its own account, an affinity for the mordant, which becomes an obstacle to its union with the tissue. And thus we must choose amongst the solvents, that whose attraction for the mordant is the weakest: and, as of all the acids which we can employ to dissolve alumine, for instance, vinegar is that which is retained with the least energy; we, therefore, generally substitute the acetate of alumine in place of alum, because the acetic acid abandons the alumine with such facility, that a mere elevation of temperature is sufficient to effect the separation of these two bodies. Before the substitution of the acetate, we used alum only; but the true reason was never known, why the dyers always gave the preference to Roman alum, and regarded it as being the most pure; and it is only within these few years that it has been known to what this preference was owing, as it had, for a long time, been improperly attributed to prejudice. M. D'Arcet was the first to perceive that this alum was not of a similar composition with other kinds, and that the greater part of it was cubic

alum; that is to say, that it contained an excess of base when compared with the ordinary alums. But the sulphuric acid can take up an excess of the base, and more than is sufficient for its saturization, but which it readily parts with; and when we heat a solution of cubic alum, we find that this superabundance of alumine separates, some in the state of a sub-sulphate, and some in the form of pure alumine, long before it has attained the boiling point. Nevertheless, we could not detect this difference, because the Roman alum, in its ordinary state, is soiled by a peroxide of iron, which clouds and obscures the solution, so that we cannot, in consequence thereof, perceive this precipitate of alumine and the sub-sulphate; and when we filter the liquid in order to crystallize it anew, we merely obtain the ordinary octahedral alum; we must, therefore, conclude, in short, that the preference in favour of Roman alum, has no real foundation; and that there exists no other difference between it and other alums, than what may result from their being more or less pure.

We will here mention an anecdote, which it may not be useless to quote in this place, in order to show how great the prejudice is against making any change in the processes employed in the arts. During the time when France was master of Rome, one of our most skilful chemists was sent there to inspect their different manufactures, and to compare them with ours. One of the chief manufactures, was this of alum; but he found that the construction of their furnaces was so bad, that their vast caldrons could only be heated at the bottom, and could not be made to boil. He strongly advised them to build them upon another and better plan, but in vain, as they were determined to follow the wise doctrine of adhering to the old established practice! Had the manufacturers followed the advice he gave them, they might have always produced the octahedral alum; as, according to the experiments made by M. D'Arcet, he always found that the cubic alum became decomposed at a temperature of from 40 to 45 degrees.

At one time the Roman alum was exceedingly scarce in France, and it therefore occasioned us to take considerable pains to purify that of our own manufacture, because we clearly perceived, as we have above stated, that its particular state was the only cause to which we could attribute the different effects obtained from it; but, as we also wished to procure an alum which should be perfectly free from any admixture of iron, which is by no means the case with the Roman alum, so we were led, according to the advice of M. D'Arcet, to add to the bath, at the moment of aluming, a little alkali. In fact, we thus produce the cubic alum, by diminishing the proportion of the acid in thus saturating a part of it.

The two principal conditions of a great division of the molecules, and their state of liberty, are fulfilled by this mordant, and its operation is easily effected; but it is to be observed, that the combination which it forms, results from a play of affinities between the solvent and the material of the cloth, which produces a species of division proportioned to the mass of the solvent. Thus, the cloth retains more of the mordant when the solution is most concentrated;

that is to say, when the insoluble base is least defended by the greater mass of the vehicle; and we found an important part of the process of dying, upon this observation. If we impregnate, for example, different parts of the same piece of cloth, with the same mordant, but at various degrees of concentration, we obtain, on plunging it into the dye-bath, a fixation of the colouring matter the more intense, as the mordant was the more concentrated. And thus, accordingly as the acetate of alumine is more or less concentrated in maddering, we produce all the shades, from the deepest red to the lightest rose colour; and with the acetate of iron and madder, all the tints from black to a light violet.

[TO BE CONTINUED.]

On the best method of Warming and Ventilating Houses and other Buildings. By MR. CHARLES SYLVESTER.

[From the Quarterly Journal of Science, Literature, and the Arts.]

[CONCLUDED FROM PAGE 315.]

NOTHING can be more obvious, than the decided advantage which this stove possesses over all others, and nothing remained for its improvement, but to give its different parts their proper proportions, and to vary its construction, so as to admit of its easy management in domestic use. By the former improvement, a larger quantity of air is admitted in proportion to the fuel consumed, and, of course, at a lower temperature. The advantages which result from this improvement, will be obvious. The ventilation of the rooms warmed by it, is much more complete, from a greater quantity of air being admitted; the temperature is more uniform, from the air being more dispersed; and, lastly, from the air being heated by a greater surface at a lower temperature, the apparatus is not in the least degree injured by the fire, and hence there does not appear to be any limit to its durability.

Nothing can be more vague and uncertain, than the opinions which have been formed of the different apparatus used for warming rooms by heated air. It has, in consequence, appeared to me a desideratum in inquiries of this nature, to be able to ascertain the power and merits of a stove, as we do those of an engine. For this purpose, my first object was to get an instrument capable of measuring the velocity of currents. After trying a variety of methods, I have found one, with which I am perfectly satisfied. It consists of a very light brass wheel, in the form of that for the first motion of a smoke-jack. An endless screw upon the same axis, gives motion to a wheel of fifty teeth, on the axis of which is an index, which is watched by the eye, when the instrument is exposed to the current. The wheel acted on by the current, is about two and a half inches in diameter, and the vanes, or sails, are eight in number, and fill up the whole circle, when their faces are parallel to the plane of their

motion, and they are adjusted to an angle of 45°. Under these circumstances, I have found that fifty revolutions of the first motion take place, while the current causing those revolutions moves through forty-six feet.

In order to ascertain the power and merits of a stove, I generally take a period of twelve hours, beginning with a good fire, and leaving off with the same. During this time, the velocity and temperature in the main warm air-flue, should be taken every half hour, and then the average of each taken, keeping an account of the coal consumed in the same time. The temperature of the outer air being also known, the excess of the average temperature above the atmosphere, is the datum required.

From the average velocity, the number of cubic feet of air passing through the flue in the twelve hours, may be known.

Put A = The number of pounds of air heated in twelve hours, allowing 14 cubic feet of air to 1 lb.

T = The excess of temperature above that of the atmosphere.

W = The weight in pounds of coal consumed in the same time.

E = The effect of the stove, which, in stoves of all sizes on the same construction, should be generally a constant quantity: since A the quantity, and T the excess of temperature, are advantages to be produced by W the weight of coal.

E, the effect will be directly as A and T, and inversely as W.

Therefore, $E = \frac{A\ T}{W}$.

To give an example in practice:—a stove which is capable of warming 100,000 cubic feet of space to 60° in the coldest season, when placed at the depth of nine feet below the level, at which the warm air is discharged, will furnish about 45 cubic feet every second, raised 60° above the temperature of the atmosphere. To keep up this current and excess of temperature for twelve hours, it will consume not more than three bushels of coals, or 252 lbs. In this case, 49 cubic feet of air in each second, will be 1,944,000 in twelve hours, equal to 138,857 lbs. Hence, $E = \frac{138{,}857 + 60}{252} = 32{,}930$.

This number may be taken as a constant quantity, expressive of the power of any stove; but it also expresses the weight of air in pounds, which one pound of Newcastle coal heats one degree of Fahrenheit's thermometer.

This number will not be strictly a constant quantity, as small stoves will not act quite to the same advantage as larger ones; and local and other circumstances will, in some degree, alter the result of experiments made in the manner above stated. This is more especially the case, when the admission of cold air and the discharge of foul air, are in any degree influenced by the wind.

The cold air is generally brought directly from the atmosphere; and, therefore, as its progress along this channel is affected by the wind, a greater or less quantity will pass through the stove. If the

air be deficient, less heat is carried off from the heating surface, and a greater proportion goes up the chimney; on the contrary, when the wind blows into the cold air-flue, the two forces conspire, more air is admitted, more heat is carried off with the air, and, of course, less is wasted up the smoke-flue.

In all situations where it is practicable, I use an effectual means of regulating the admission of cold, and the escape of foul air, by placing at the commencement and termination of these apertures, a turn-cap, or cowl, in which the vanes are so fixed as to let the wind blow into the one, and assist the escape of air from the other. Although this contrivance will always prevent a counter current, which, without its use, is sometimes the case, it does not prevent unequal quantities of air from entering, according to the strength of the wind. This is not found in practice to be a great inconvenience, for, during the most perfect calm, the air admitted by the power of the stove alone, is sufficient for every purpose of warmth and ventilation: whilst, with a tolerable fire in the stove, when the wind is considerable, the air comes into the rooms at a higher temperature than the rooms require, which is at least erring on the desirable side. If the quantity of air admitted under all states of the wind, were required to be uniform, the aperture in the turn-cap for cold air, might contain a self-adjustment, by the action of which its area would always be in the inverse ratio of the velocity of the wind; by which means equal quantities of air would always be admitted in equal times.

The turn-cap for the escape of foul air, is placed at the top of the building, and is made common to the roof. Under this arrangement, all the rooms into which the warm air is admitted, have each a foul-air flue terminating in the cavity of the roof.

The contents of all the foul-air flues, are, therefore, ultimately discharged at the turn-cap. This arrangement is adopted at the Derbyshire General Infirmary, and at the Wakefield Lunatic Asylum. In the summer season, when the stove is not in action, the ventilation will depend on the wind, which, at some periods, may not be adequate to that change of air required in hospitals. In such cases, I have adopted an additional means of ventilation. Instead of making the foul-air turn-cap common to the roof, I have placed it at the top of a cylindrical cavity, built in the roof. Into this cavity, I bring all the foul-air flues, which, also, in this case, may be smoke-flues, if constructed with brick. I also connect with the same cavity, the stove chimney, and, if possible, all the other smoke-flues in the building. By this means, it may be expected that some degree of rarefaction in the cylindrical cavity in the roof, will be constantly going on, and that hence a perpetual current will be established from every room towards the general outlet. It would be difficult to adapt such an arrangement to old buildings, without great alteration in the roof. But it would be easily introduced into new houses. The advantages derived from it in ordinary dwellings, would be very great. In the first place, there could not be an instance of a smoky chimney; in the next, a down current in an un-

occupied chimney, could not occur, and, therefore, the passage of the smoke of one chimney down another, would always be prevented; and lastly, by having only one outlet for smoke in every house, and that an object which may be made ornamental, we should ultimately get rid of the great deformity which arises from the present appearance of chimnies in buildings.

In all situations where it is practicable to make a cold-air flue, of considerable length under ground, the advantage is well worth securing. I have found by experience, that a cold air-flue of 50 yards in length, is capable of cooling the air in summer, to about an arithmetical mean, between the temperature of the air and the earth, and a similar advantage is produced by the earth warming the air in the winter season. The shape of the cold-air flue should be such as to present the greatest possible surface; the very contrary being essential to the best construction of flues for the warm air.

These facts will successfully lead to the means of cooling buildings in the tropical climates, and of warming the air when the winter's cold is much below the temperature of the earth.

On the Value of the Evidence from the Animal Kingdom, tending to prove that the Arctic Regions formerly enjoyed a milder Climate than at present. *By the* Rev. John Fleming, D. D. F. R. S. E.

It was long a favourite opinion among naturalists, that all the species of animals or vegetables, which the omnipotent Creator ever called into being, still remain the inhabitants of this globe, independent of the dangers to which they have been exposed, or the changes which have taken place in their geographical distribution. The difficulties which attended the acknowledgment of this opinion, arising from the number of singular forms found imbedded in the regular strata, or distributed among the loose materials on the surface of the earth—forms indicating species which the neighbouring districts did not possess—were conceived to be in a great measure removed, by the supposition, that unknown regions might yet exhibit living examples, in addition to many species of which the naturalist had obtained no information. In proportion, however, as the progress of geography extended our acquaintance with distant regions, and failed to furnish the requisite examples, the opinions of naturalists experienced a corresponding change. The ancient creed was at length abandoned; and no one, acquainted with the subject, refused to acknowledge, that in the earth were preserved the relics of numerous species which have no longer a place among the living on this globe.

The characters of the extinct species, after this change in public opinion, presented to the philosophical observer, an extensive field of research and speculation. Prevented now from expending his resources, in seeking out the dwellings of animals which no longer

exist, his attention was directed to the characters of those extinct species, the relics of which the strata had preserved, with the view of tracing their relations with the living tribes. The bones of the mammoth, occurring in the loose strata, were speedily identified with those of an elephant. The shells and corals of the older strata were exhibited, as resembling the productions of equatorial seas; while the impressions of vegetables, found in the shale of our coal-fields, were traced to be analogous to the productions of tropical forests. The conclusion seemed to be warranted, by an extended induction, that our region once enjoyed a tropical climate, at which time our rivers were swarming with alligators, our lakes with tortoises, and our seas with corals; when our caves were the haunts of bears and hyænas, and our forests the resort of the elephant and tiger. Nay, that in those northern regions, now suffering, during so great a part of the year, all the rigours of an iron winter, the climate was once so mild as to permit the residence of the rhinoceros and the elephant.

Imposing as these conclusions certainly appear, their validity might, with propriety, have been called in question, when naturalists, ceasing to rely on general appearances, examined more narrowly specific characters, and announced, as a result of their labours, that the extinct animals, though generically related to the tropical kinds, were yet to be viewed as *distinct species*. The argument in favour of a *change of climate*, which these fossil remains formerly seemed to furnish, now unsupported by observation, was found to rest entirely on analogy. Yet, in spite of this change of character, it is still relied on with confidence, as yielding support to hypothetical views; and few geologists of eminence could be mentioned, in whose writings it has ceased to occupy a prominent place. Some anxiously seek for proofs of a change of climate, on the supposition that our planet was once fluid by heat, and is still in the act of cooling; while others, guided by their notions of magnetism or electricity, are equally sanguine in their expectations of perceiving proofs of change.*

If it be admitted that the extinct animals are different *in species* from the existing kinds, and here, we presume, there is no difference of opinion, we shall be able to bring the subject into that form in which accurate conclusions may be obtained, or the value of those previously announced brought to a suitable test. Indeed, the whole argument in favour of a change of climate, seems to depend on the value of *analogy*, as an instrument of research. Supposing ourselves acquainted with the habits and distribution of one species of a genus, can we predicate, with any degree of safety, concerning the habits and distribution of the other species with which it is generically connected? Geologists ought to have investigated this preliminary question with care, before they commenced their specu-

* Professor Link in his Urwelt, or Antediluvian World; Kruger in his History of the Antediluvian World; and other modern writers on geology, oppose the opinion of Cuvier, and advocate the view discussed by Dr. Fleming in this memoir.—Editor.

lations. Instead, however, of acting with such caution, they have assumed that the question may be answered in the affirmative; or, rather, it does not appear that they were aware of any difficulty in the case, or conceived for a moment that their regulating principle might have no higher authority than a *petitio principii*.

Geologists, it is true, were countenanced, to a certain extent, in reposing confidence in *analogy* as their guide, by the authority of the most zealous, enlightened, and successful comparative anatomist the world ever possessed, Baron Cuvier. Successful in the employment of this instrument, in several instances, assisted, however, by numerous observations, this anatomist, under the influence of prejudices which few can avoid, has stated his confidence in the certainty of its deductions, with a boldness, which is the more astonishing, as it is equally at war with his own admissions and well known facts. "Any one who observes only the print of a cloven foot, may conclude that the animal which left this impression, ruminates; and this conclusion is quite as certain as any other in physics, or in moral philosophy."—*Recherches sur les Ossemens Fossiles*, i. 51. Observation had discovered many animals with cloven hoofs which ruminated; but, in such circumstances, would it be safe to infer that all cloven hoofed animals ruminate? Conceive ourselves contemplating the footmarks of a sheep and sow. Under the guidance of Cuvier's declarations, we would conclude that both ruminated,—an inference true in the one case, and false in the other. Observation here warns us against the employment of a guide so liable to deceive us. But this charge against analogy, may, perhaps, appear in greater strength, after the reader has perused the solution of the following questions.

1. *If two animals resemble each other in structure, will their habits be similar?*—If this question could be answered in the affirmative, it would greatly heighten the interest which is attached to the study of fossil remains, by giving to our observations an authority which at present they do not possess. The comparative anatomist has traced a considerable resemblance between the skeleton of the hippopotamus and the common ox. No analogy, in this case, would have led the inquirer to form even the slightest suspicions respecting the existence of those aquatic habits of the former animal, which constitute so singular a feature in its character. Let us place on a table the skeletons of the ermine, the polecat, and the otter, and the general resemblance of these to one another, would at once be admitted; and, confiding in our *analogies*, we might pronounce their habits to be similar. Observation, however, would convince us that these three species were different in their habits and propensities, though included by Linnæus in the genus Mustela. The common bear and arctic bear, exhibit equal resemblances of structure, and equal differences of habits. These facts, and multitudes of the same kind which might be produced, intimate the propriety of relying on analogy with caution, in all those cases to which our observation does not extend. The skeleton of the hippopotamus could not give any intimation of the diving powers of the animal, nor

would the bones of the feet of the otter lead to the supposition of its having webbed toes. Osteology, indeed, gives but very imperfect indications, even of external form, in many animals. Would the round caudal vertebræ of the seal, indicate the depressed tail of the animal, or the depressed bones of the face, in the whale, indicate the remarkable fulness of the outline of its head? We may agree with Cuvier in supposing that the mastodon had a proboscis like an elephant (to enable it to procure its food from the ground,) from the general resemblance of the two animals in structure, from the length of its legs, and the slight development of the toes; but when we remember the giraffe, with its head proportionally farther removed from the ground than the mastadon, able to provide food without a proboscis; and the hippopotamus and the dipper (*Cinclus aquaticus*,) which are excellent swimmers, though seemingly ill suited for the exercise, we shall view the conjecture in no other light than a probability, and not remarkably strong.

2. *If two animals resemble each other in external appearance, will their habits be similar?*—It is seldom, indeed, that two animals resemble each other, in all their organs, so very closely as to render it difficult for the attentive observer to discriminate species. Some modifications of form and structure usually occur in the one species, which cannot be perceived in the other, and which serve to influence its habits. But even in those cases where approximations of form are the closest, do we perceive a similarity of actions? If this were the case, the study of Natural History would be comparatively easy, as the field of observation would be reduced within accessible limits. The truths of zoology, however, forbid the indulgence of such expectations. The habits of each species must be studied as a separate subject of investigation, permitting analogy to assist, but in no case to guide us. The examples to justify this statement, may be taken from any one of the classes of the animal kingdom. The common shrew frequents old walls, and dry, grassy, banks; while the water shrew dwells on the margins of ditches, and swims and dives with ease. The common mouse, the pest of houses, itself improvident, seeks after the storehouses of men; while the field mouse frequents gardens and fields, and is not only a storing animal, but susceptible of torpidity. How different the solitary or pairing habits of the porpoise, from the gregarious wandering grampus. In birds, the same difference of habit accompanies generic resemblances. The rock dove builds its nest in caves, (and hence the plan of dovecots,) and delights to rest on a grassy bank; while the ring-dove frequents the forest, resting and breeding on trees. How dissimilar, in habit, the rook and the jack-daw, the heron and the bittern? Equally different the char, the sea-trout, and the common trout. Whether we contemplate *species*, in reference to their food, their haunts, their protection against foes, or the method of rearing their young, we find each exhibiting peculiarities, of which a knowledge of the habits of its congeners would not have given us the slightest

intimation.* But a third subject of inquiry yet remains to be investigated.

3. *If two animals resemble each other in form and structure, will their physical and geographical distribution be similar?*—Nearly the same anomalies present themselves, when considering animals in reference to their stations on the globe, as when viewing them in relation to their habits. Every species has its own appointed place, influenced in all cases by latitude, and even sometimes by longitude. The zebra delights to roam over the tropical plains, to which it is, in a great measure, restricted; while the horse can maintain existence, even throughout an Iceland winter. The buffalo, like the zebra, prefers a high temperature, and cannot thrive, even where the common ox prospers. The musk ox, on the other hand, though nearly resembling the buffalo, prefers the stinted herbage of the arctic regions, and is able, by its periodical migrations, to outlive a northern winter. The chacal (*Canis aureus*) inhabits Africa and the warmer parts of Asia; while the isatis (*Canis lagopus*) resides in the arctic regions. Species of the genus felis, likewise inhabit every climate, each limited in geographical distribution. The African hare and the polar hare, have their geographical distribution expressed in their trivial names. Ornithology might be called on to furnish examples equally illustrative of the question under discussion. The red grous is confined to the United Kingdom, in its geographical distribution, and is a bird which we may consider as peculiarly our own; while the ptarmigan has a range of dwelling, extending to the higher northern latitude of 74°.

The resources against the vicissitudes of the seasons, appear to exhibit equally remarkable differences according to the species. Thus, while the grous braves, unchanged in colour, the rigours of our winter, the ptarmigan assumes a white plumage: while the favourite redbreast spends his winter almost under our immediate protection, the nightingale betakes herself to a warmer climate. The yellow bunting remains with us throughout the year; the snow bunting only visits us in winter, and retires to spend the summer, and rear its young, on the rocks of Greenland.

From the preceding statements, which might have been extended to an almost indefinite length, the conclusion appears unavoidable, *that every species is controlled by its own peculiar laws*, and that no acquaintance with one species of a genus, however extensive and accurate, warrants us in predicating concerning the habits and distribution of any other species, even though very striking resemblances, in structure, and form, may prevail. What, then, is the amount of the argument, leading to the belief that the arctic regions once enjoyed a milder climate than they now possess, derived from the relics of animals found imbedded in the soil?—Remains of an elephant and of a rhinoceros, have been found in Siberia! These animals at present live under a warm climate; and when Siberia was peopled

* The reader will find some other illustrations of this subject, in my "Philosophy of Zoology," vol. ii. p. 88.

by such animals, its climate must have been much milder than in the present day!—If the relics of the elephant and rhinoceros, found in Siberia, belong to the *same species* which now dwell in equatorial regions, we must either suppose that they were transported to their present tomb, or, if they were the denizens of the country, that the climate of Siberia has greatly changed. In such circumstances, our conclusions would be supported by the truths of science, for, in reference to the *individuals of a species*, our knowledge of the ordinary habits and distribution of a few of these, qualifies us for judging respecting the remainder.* If, however, it shall be found that the relics of the elephant and rhinoceros of Siberia belong to *species different from those which now dwell in tropical forests*, our speculations must change their character, for the truths of zoology forbid us to reason concerning the *species of a genus*, in the same manner as we do with the *individuals of species;* and all our prejudices, associated with the *names* we use, must be dismissed from the mind.

Viewing, then, the Siberian elephant and rhinoceros, as different *in species* from those which we conceive peculiarly fitted to reside in a tropical climate, and the proof of this difference has been satisfactorily established, our conjectures respecting their original condition, must be conducted on widely different principles. If still unwilling to allow that these species ever resided in Siberia, but inclined to consider them as having been conveyed by some current of water from another and warmer region, we have to determine the locality of their residence at the very outset of our speculations. Now, these species no longer occur in a living state, in any region of the earth. Their former geographical distribution can be inferred only by the dispersion of their bones. These relics occur very frequently in the north of Europe, Asia, and America, in the higher latitudes, become scarcer as we proceed towards the south, *and do not occur within the geographical limits of the existing races.* It is vain, therefore, to have recourse to diluvian transportation, when we cannot point out the place from whence they may have been brought. If we admit that these extinct species lie buried in those very regions in which they formerly resided, and the whole circumstances of the case warrant the conclusion, what are the inferences which we may legitimately deduce? That as these species appeared to

* Sir Everard Home has, it is true, attempted to prove the identity of the Siberian and African rhinoceros, by considering the skull of a recent individual, brought by Mr. Campbell from Mashow, in South Africa (and which occupies a place in the museum of the London Missionary Society, and is recorded in the catalogue, p. 10.,) as having a perfect resemblance to those of the Siberian species.—*Phil. Trans.* 1822. In the twenty-second number of the Edinburgh Philosophical Journal, I intimated my suspicions of the accuracy of this opinion, founded on the great difference in the physical and geographical distribution of the two animals; and the inquiries which I made in London, in the spring of the following year, justified the view which had been adopted. Baron Cuvier's inquiries, about the same time, led to a similar conviction, that the celebrated London anatomist had been betrayed into error, by a too hasty and superficial examination of the specimen from Cafraria.—*See Cuvier, Oss. Foss.* iv. 493.

have lived in Siberia, they, consequently, must have possessed habits suited to their geographical distribution. This is reversing the ordinary notions on the subject; for, instead of suiting the climate to the species, we consider the species as suited to the climate. Nor are we left in doubt on the subject. The museum of nature has furnished us with a specimen to which an appeal can be made. The entire *carcass* of a Siberian elephant, or mammoth, as it is termed by the Russians, was found about twenty-two years ago, by Mr. Adams, (the bones of which form the skeleton in the Museum of the Imperial Academy at Petersburgh,) preserved in *ice*, near the mouth of the river Lena, on the shores of the Frozen Ocean. Did the skin present, externally, that thinness of hair, scaliness of surface, and naked appearance, which characterize the living elephants of the equatorial regions, or did its condition, as to hair, indicate an animal fitted, by its clothing, to reside in a cold climate? The covering was of three kinds:—*bristles* nearly black, much thicker than horse hair, and from twelve to sixteen inches in length;—*hair* of a reddish-brown colour, about four inches in length; and *wool* of the same colour as the hair, but only about an inch in length. Though much of the fur was lost, upwards of thirty pounds weight were gathered from the wet sand bank. Here, then, is a demonstration, that the Siberian elephant was not, from the abundance of its clothing, fitted for a warm country, but destined for a dwelling of an opposite character. In other words, that the Siberian elephant was fitted for braving the severity of a northern climate, and that at the period in which this individual died, there was freezing taking place in Siberia, much after the same manner as at present. To form an accurate conception of the Siberian elephant, or mammoth, we must not imagine an animal naked, like the African or Asiatic species, but enveloped in a shaggy, thick covering of fur, like the musk ox, impenetrable to rain or cold. The carcass of the Siberian rhinoceros, found on the banks of the Wilhoui, in 1770, by Pallas, gave similar indications of its hairy covering, being suitable to an arctic animal.

Perhaps there may be some readers, irritated at the overthrow of a favourite hypothesis, ready to offer the following objection. How could such animals, as the elephant and rhinoceros, find means of subsistence in the northern regions, which are so scantily supplied with herbage? There is no difficulty in conceiving the elephant capable of securing food, when we know that many of our largest quadrupeds at present people those regions; such, for example, as the musk ox, the moose deer, and the bison. The kind of food these ancient elephants employed, will, probably, never be ascertained, and we do not possess the means of forming even a feasible conjecture. We may know the kind of food the existing species prefer, but this yields no aid in determining the taste of the extinct species. Who is there acquainted with the gramineous character of the food of our fallow deer, stag, or roe, that would have assigned a lichen to the rein-deer?

Yet, reluctant to admit that Siberia was once peopled by elephants,

the reader may be disposed to ask, how could such animals outlive the winter? This question can only be answered by a reference to the history of animals in similar circumstances. The modern northern animals *migrate*, and we entertain little doubt that the Siberian elephant was equally disposed to the shifting of place, with the changes of the season.

Those who have been misled by the prejudices connected with the names *elephant* and *rhinoceros*, and, in consequence, have conceived the climate of Siberia to have been warm of old, to suit their supposed tropical animals, may yield to the force of the preceding arguments. Those, however, who imagine that our earth is red hot at the centre, as it was formerly at the surface,—that the period is not long passed by, since the crust became so cool as to allow *climate* to operate, will be inclined to retire from the untenable outpost, formerly occupied by the mammoth, to the more inaccessible strong holds of our lime quarries and coal pits. The strata, accompanying our coal metals, abound, say they, with the impressions of plants, which do not resemble the modern productions of our country. In order to find analogous forms, we must betake ourselves to warmer climes, and trace in the reeds, the palms, and the ferns, reared under a tropical sun, species resembling those relics which the older strata have preserved. And, if the fossil plants resemble tropical species, is not this a proof that our climate once resembled a tropical one? Two things very different are here confounded. Our fossil plants may resemble tropical plants; but if they are not *individuals* of *the same species*, the data which they furnish, however useful in tracing *affinities* of form or structure, furnish no clew whatever for determining geographical or physical *distribution*,—for it is with plants as with animals,—we may reason safely concerning the individuals of a species, but not concerning the habits and distribution of one species, from our knowledge of the characters of any other species of the genus to which it belongs. This country, cold as it is, may have had its palms, its cacti, and arborescent ferns, under a temperature similar to the present, due regard being had to species, not genera; for, at a comparatively recent period, and within the shade of the genealogical tree of our existing quadrupeds, Britain possessed an elephant, a rhinoceros, a hyæna, and a tiger.

[*Edin. New Philo. Journ.*

On the Natural Zero, according to Fahrenheit's Scale. By SIR GEORGE CAYLEY, Bart.

GENTLEMEN,—I send you the following considerations respecting the natural zero, which, though, perhaps, not perfectly conclusive, yet lead to a strong probability that the point of absolute privation of transferable caloric, as respects temperature, takes place at 448 degrees of Fahrenheit's scale, below his 0°, taking such degrees of this scale as range between 32° and 212°, as the standard, and

leaving the more refined inquiry as to their inequality, at present out of the question, though fully admitting that the zero I have named, must, hereafter, be regulated by the final result of that inquiry.

It appears that hydrogen gas at a mean temperature, is about 11,242 times lighter than water, and also that it can exist as a component part of water: hence, if it were mechanically condensed 448 times, when of the temperature of 32°, and supposing the particles to be as dense as water, there would still remain twenty-two fold more space unoccupied than occupied by them; hence, there would be no reason to suspect that their chemical relation to each other would be altered or deranged by this condensation. If 10,000 cubic inches of hydrogen gas, under mean atmospheric pressure, at a temperature of 32°, be elevated to the temperature of 212°, it will be expanded to 13,744 cubic inches, and all the experiments that have been made on the subject prove, that the expansion or contraction of all the gases, at a temperature of 32°, proceeds in perfect uniformity with the addition or privation of caloric, as measured by the thermometer, giving one 480th part of the whole bulk for each degree of Fahrenheit's scale. As this is the property of *all* the permanent gases, differing so widely as they do in their specific gravities, chemical qualities, and in their specific relation even to caloric itself, it seems to point out that in these aëriform fluids, when chemical attraction is in their own nature overcome, the expansion becomes the actual measure of the transferable caloric they contain, in that relation to heat we call temperature. In all these gases, if we could reduce the temperature 480° below 32°, all bulk, as connected with temperature, would cease; the particles would become contiguous, and deprived of all elasticity. The effect seems the measure of the cause; they originate and cease together. It may be argued against this theory, that steam, and the vapours of different fluids, as those of æther, alcohol, &c. are found to expand with equal uniformity by equal additions of temperature; but that each vapour has its own grade of elasticity: and hence that privation of caloric at which elasticity would cease, differs in each; chemical affinity between the particles in these cases, seems to exert, to a certain extent, a controlling power over caloric, and to modify its action. There is also a chemical combination of caloric with these fluid substances when they change to a state of vapour, which may materially affect their relation to transferable caloric: thus steam of 212° contains about 960° of caloric in chemical union, which does not affect its temperature. It depends upon the degree of pressure the water is exposed to, at what temperature it will rise into vapour, and commence this vast but imperceptible absorption of caloric. An additional pressure of three pounds per square inch, requiring about ten degrees more temperature before vaporization commences; hence, the power, whatever it be, by which the caloric enters into chemical union at 202°, is three pounds per square inch less forcible than at 212°, and six pounds less than at 222°, the whole power at 212° being equal to about fifteen pounds per square inch. The same ratio

exists as to this power in alcohol at 176°, and in æther at about 98°; in the former 38 degrees below the boiling point of water, and in the latter 128°. The expansive power arising from temperature in these cases, is evidently modified by the chemical affinities of these substances, as is rendered more evident by the circumstance that æther, the boiling point of which is so much below that of alcohol, freezes at —46°; whereas alcohol has been exposed to a temperature of —91° without freezing; and it rests on one authority only that it can be congealed at all, and that at a temperature of —110°. The striking circumstance with respect to the permanent gases, is, that they all agree as to the privation of temperature at which they would cease to be elastic. In their chemical formation, they seem to have embodied, permanently, as much caloric as neutralizes all attraction between their particles; and hence every addition of temperature from the natural zero, exhibits an expansion, or a force equivalent, if unrestrained, to generate expansion.

When we see that a few pounds pressure per square inch, has so much effect upon fluids when upon the point of rising into vapour, and contemplate the power which the particles of water exert when passing into the state of ice, so as even to split bomb-shells and cannon,—it seems very probable that in vapours, the effects of temperature are disturbed by counteracting forces, but that they have their full and undisturbed influence with perfect uniformity in the gases; and that all these point to 480° below 32°, or 448° below 0°, as their temperature of non-elasticity, or privation of all transferable caloric. There is an apparent contradiction to this hypothesis, in the circumstance that common air, when suddenly condensed seventy or eighty times, kindles the tinder called amadou, and fires gunpowder, &c.; but as the *capacity* of bodies for caloric, is in some inverse ratio of their density, much heat must be evolved by such a great increase of density; even a red heat is soon excited, by the condensation of soft iron under the hammer, to the extent of only 1-33d part of its bulk; and hence the fact is sufficiently accounted for, and is a case quite distinct from the caloric of temperature.

For the purpose of showing how small a proportion there is between the 448 degrees I have assumed as beyond the zero of Fahrenheit, and the absolute quantity of caloric embodied by some of the permanent gases, let two volumes of hydrogen gas be condensed 448 times, when of the temperature of 0° Fahr.; and as this is the proper proportion to generate water by combustion, supposing the particles to be each of the density of water, they would not be reduced to contact by this degree of condensation, but would have about sixteen times more space unoccupied than occupied: hence their chemical constitution would not be endangered, unless done too suddenly, so as to evolve caloric enough to ignite them. If this mixture were reduced to the temperature of 448° below 0°, the particles would then be in contact, and require no pressure to keep them so. We may, probably, assume, without much error, that from the reduced capacity as to caloric, as much of it will have escaped, from this cause, as would raise the temperature of the con-

densed mass, about 900 or 1000 degrees, and at the same time it will have lost by temperature, 448°: thus it might be said that 1448 degrees of heat are parted with by the gases, before they reach the natural zero; but it is obvious that the 448° only, are due to the account of *thermometrical temperature;* the other to a separate and distinct cause; viz. the diminution of capacity with respect to the caloric permanently embodied in these gases, by chemical combination. I shall quote from some experiments by Count Rumford, on the caloric generated by combustion, that one pound of hydrogen gas used as fuel, will raise 410 pounds of water from 32° to 212°, or 180°; (this estimate may not, perhaps, be very correct, but is sufficient for my purpose,) one pound of hydrogen gas requires eight pounds of oxygen gas to saturate it in the formation of steam, or water, by combustion; and hence, the whole caloric, which in the other instance was applied to 410 pounds of water, is, during the combustion, applied to the nine pounds of steam, or water, generated; and, therefore, its temperature considered as water, would be raised as much more than 180°, as 410 exceeds 9 ($45\frac{1}{9}° \times 180$,) or 8200 of Fahrenheit's scale. If we knew with more accuracy the proportionate capacities of water, and of these gases, we might thus tolerably ascertain the actual ratio between that caloric which is chemically combined, and which seems to constitute the gaseous state, that which is lost by temperature, and that which is lost by reduced capacity. If we assume that, when these two gases are reduced to the contact of particles, by a temperature of —448, they have the same capacity for caloric as water, and that in the condensation, they have lost 1000 degrees by reduced capacity, we shall have the proportion of that which is moveable by both causes, when compared with that chemically combined and permanent, as 1448 to 8200, or nearly as 1 to 5.7. It is of great importance to ascertain the actual commencement of our scale of temperature, as it would lead to an accurate knowledge of what certain determinate quantities of caloric can effect, and it would become measurable, as the other constituents of compound bodies are. It is very probable that caloric will be found to combine in distinct doses, when it enters into those chemical unions not affecting temperature. If we assume —448 as the true zero, and assume 20° as a dose of caloric, the history of water in its relation to it, would stand thus: we should have twenty-four doses, or 480° of heat in ice at 32°; an addition of seven doses, or 140°, melts it to water; nine doses, or 180°, brings it to the boiling point, under atmospheric pressure, and forty-eight doses more, or 960°, generates steam at 212°. [*Phil. Mag.*

On the Nature of Light and Shadow, demonstrating that a Black Shadow can be rarefied, without Refraction, into all the Colours of the Rainbow. *By* JOSEPH READE, M. D.

I BEG leave to return you my thanks, for the correctness with which you have published my experiments on light,* and I hope the

* See Phil. Mag. vol. lxiii. p. 27, &c.

following novel experiment, may be favourably received by your scientific readers.

Experiment 1.—Having placed a table at about ten feet from a well lighted window, I placed on it a candle in a high candlestick. I now held a quire of white paper parallel to the table, and at right angles with the lighted candle: on holding this paper rather close to the blaze, two shadows were produced by means of a piece of coiled paper held immediately near the quire; the one next to the candle, was a bright orange, the other a bright blue. On turning the quire of paper towards the window, so as to cut off the light of the candle, this orange shadow changed to a perfect black; and on turning the quire of paper towards the candle, and excluding the light of the sun, the blue shadow likewise changed to a perfect black. Here I changed orange and blue colours into black, and *vice versa*, without any possibility of refraction. This experiment may be made by holding the paper behind the candle.

Experiment 2.—The former experiment was made with the paper between the candle and the window: I now held the paper close behind the candle, and perceived two shadows, the one orange, produced by the light of the window, rarefied by that of the candle; and the other blue, rarefied by that of the sun. On bringing these shadows on a straight line with the window, they overlapped, and produced one shadow of a perfect green colour. The orange shadow could be changed to a yellow, by bringing the shadow near to the blaze of the candle; or it may be made a brown, at a still greater distance: in like manner, the blue shadow could be changed to a perfect violet, by removing the paper to a certain distance from the blaze, and likewise to indigo. Thus we have all the colours of the rainbow, or spectrum, except red and purple: indeed, we have an extra colour, never to be found in the prism—brown.

Experiment 3.—About one o'clock, I perceived a large spot of light reflected by the sun on the side wall of my study, and it occurred to me that the colours might be different. Anxious to produce a red from a black shadow, having held the quire of white paper opposite this reflected light, and holding the coil of paper over it, I perceived two shadows, the one yellow, the other purple; and on holding a lighted candle near the purple, it changed to a lake, or perfect red. For the purpose of changing this red to a black, I stood between the paper and the side window, so as to intercept the light coming from the clouds, and only to admit the reflected sunshine to the paper; when the purple immediately changed to a black, the candle being previously removed. Thus, without any refraction, have we changed a black shadow, into all the variety of colours in the spectrum; for the most devoted admirers of the Newtonian doctrines, cannot argue that the atmosphere between the candle and the paper was a refracting medium, or that it stopped some and transmitted others, of the solar rays; all astronomers admitting that the rays coming from the sun are nearly parallel, on account of the great distance. I forgot to remark, that on bringing the candle to act on the purple shadow, a blue shadow was formed, as in the other

experiments; and, consequently, there were three shadows on the paper,—blue, lake, and yellow; the blue rarefied by the candle, the lake produced by the sunshine, and the other formed by the light of the window; for it is well known that every different light forms a separate shadow. As to the idea that black proceeds from the absorption of the seven rays of compound light, it is completely upset by these experiments; for we cannot suppose that the quire of white paper was at one moment an absorbing substance, and at the next a reflecting one; therefore, we must admit, contrary to the opinions of Boyle and Newton, that black is as much a reflected and independent colour, as blue, red, or any other colour of the seven. I shall not take up the reader's time, by quoting the opinions of Otto Guericke, Buffon, Bouguer, Melville, and others, on blue shadows; as they all accounted for blue shadows on the Newtonian theory, and never dreamt that a black shadow could be changed into all the colours of the rainbow, supposing that the fainter rays were stopped in the atmosphere, and the blue reflected. Some years ago, when writing the "Experimental Outlines," I had not attended to this part of my subject sufficiently, therefore could not account satisfactorily for the green which Buffon saw on the garden wall at sunset. This I now find proceeds from the overlapping of blue and yellow shadows, rarefied by the light of the sun, and light reflected from the clouds, or the cliff of the mountain. As these philosophers were involved in a labyrinth as intricate as that of Rosamond's Bower, and from which no clue could ever extricate them, I shall not attempt to follow them any further. [*Phil. Mag.*

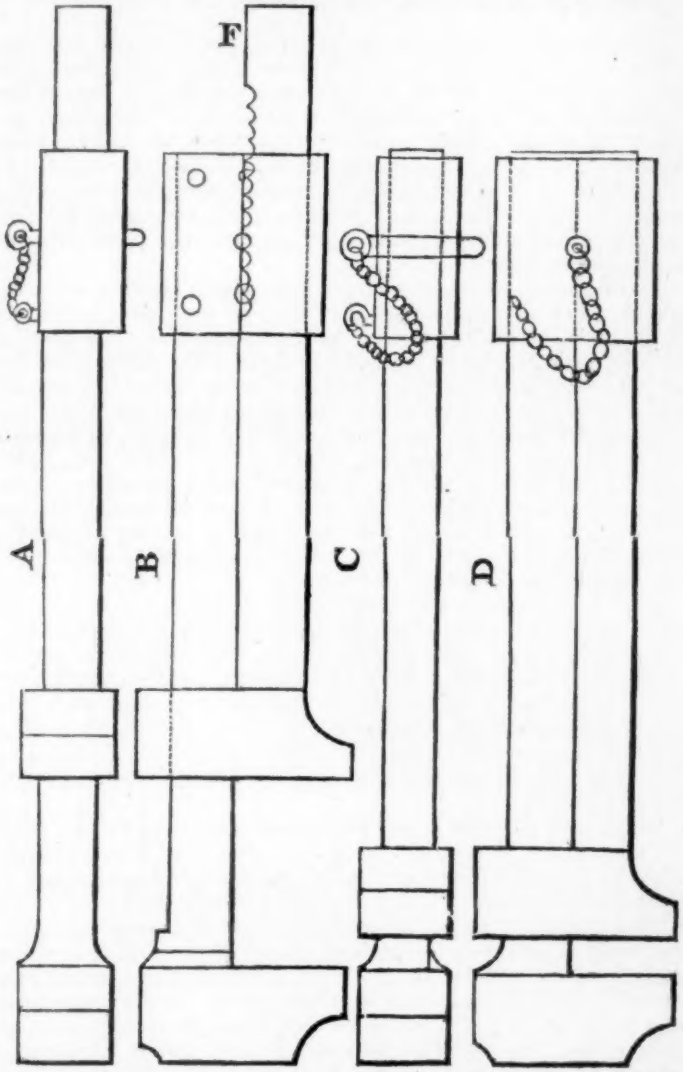
Description of a Shifting-Spanner, for Screw Nuts, intended as a substitute for the Screw-wrench, and also for the Wedge-Spanner.

For that well known instrument, the screw, or coach-wrench, a substitute was proposed and described two or three years since, in some of the English Journals. The sliding part of this wrench, or spanner, was secured by a wedge, instead of a screw. Its principal recommendation, was, the facility with which it could be made by any common smith. In a recent number of the *London Mechanics' Magazine*, another mode of fixing the slide is recommended, in which neither the screw nor wedge is employed; this plan is represented in the subjoined wood cut.

The figures A and B represent a back and side view, the spanner being open. A socket, or thimble, is formed and rivetted on to the fixed part, as represented at the upper end of B. Across the sliding part F, semicircular notches are filed, one close to the other, like saw teeth, and one, two, or three, similar notches are made across the fixed part B, opposite to which holes are drilled through the socket, or thimble; through these a round pin may be passed, which will secure the slide in its place, and its distance may thus be regulated with great precision. The pin may be attached to the socket,

by means of a small chain, and may be fixed and removed with the utmost facility.

The figures C and D, represent the spanner as closed, when the



two ends stand even. The jaws are still separated to a small distance, to allow of strengthening the fixed bar, by forging it in the bracket-like form seen in the drawing.

On the means of Propelling Boats on Canals. By Mr. David Gordon, *of London. Communicated by the Author, in a letter to the Editor of the Repertory of Patent Inventions.*

Sir,—Should you consider the following particulars of a voyage I lately made from London to Manchester, in a steam boat constructed on the plan for which I obtained a patent, (a copy of the specification of which you inserted in the 1st vol. of the present series of your work,) likely to prove of interest to the readers of the Repertory, you will, perhaps, allow them to be inserted in your ensuing number. If increased speed, certainty, and the saving of expenses, be objects to canal proprietors, I feel very confident that the present invention, if judiciously adopted, will prove of great importance to them.

The objections to steam boats on canals, have, hitherto, been the projections of the wheels, the injury done to the sides and bottom of the canal, by the agitation of the water, from the blow given to it by the paddles, and by the paddles occasionally striking and destroying what is called the puddling. In my boat, these are obviated by having the paddles near the stern, within the line of the bottom and sides of the boat, and completely enclosed, both under, and at the sides of the paddles, with a plate of sheet iron, which not only prevents any possible agitation of water from the paddles, but also protects the wheels from being injured by coming in contact with the bottom or sides of the canal, by striking against the locks or bridges, or by being struck in passing, (a very frequent occurrence) by the other boats in the canal.

That my steam boat would cause less injury to the sides of the canal than even any other boat displacing the same quantity of water, and propelled with equal rapidity, I expected, because the principal injury to canals arises from the wave which follows the boat, to fill up the hollow it leaves; and the paddles of my boat drawing a quantity of water from considerably before them, and discharging it behind, fills up that hollow. The water, in fact, behind my boat, instead of being in one following wave, is all broken, and makes 15 to 20 small waves.

In going to Manchester, my steam boat went from $2\frac{1}{2}$ to 3 miles per hour, and in returning, from 3 to 4 miles; and I am confident might be propelled from 4 to 5 miles per hour, without causing so great a wave as another boat going half a mile slower.

This would be a rate quite sufficient to induce passengers to adopt that mode of conveyance, especially to mechanics and their families, going from one manufacturing town to another. But it would soon be not alone the industrious and saving portion of the community, who would travel by the canals, because these pass through beautiful parts of the country where no roads do, and would, therefore, be adopted by parties of pleasure in the summer, if canal steam boats were once properly fitted up for passengers, and at all times by invalids, and those that were not in a hurry.

I estimate the saving of expense as follows:—A ten horse steam engine, placed in one long narrow boat, and occupying, with the other machinery, not one-third of the measurement tonnage, carrying passengers and light goods, and towing another boat, at the rate of 4 miles per hour, would not consume more than 1 cwt. of coals per hour, which, where coals are cheap, which is usually the case on canals, would not be more than from one-third to one-eighth of the present cost. In all the wide canals, both boats could go into the locks together, and thus lose no time in passing them. In this manner the trade might be carried on from London to Coventry, or Atherstone, as in all that long distance, there are only three locks where the two boats could not pass together.

I am your most obedient servant,

DAVID GORDON.*

FRENCH PATENT.

Brevet d'Invention, to MM. BRACONNOT *and* SIMONIN, *for the manufacture of a substance analogous to wax, called* CEROMIMEME, *proper for making Candles and Soap, and producing, in the process, Sulphate of Potash.*

THIS substance, which may be substituted in place of wax, for many purposes, but particularly for producing light, is extracted from all animal fats, by the following process:—

The fat, or suet, from which the concrete matter is desired to be extracted, is diluted with a variable quantity of volatile oil, commonly that of turpentine. The mixture, placed in cylindrical boxes, lined with felt, and whose sides and bottoms are pierced with numerous small holes, is submitted to a gradual and very strong pressure, which expresses the volatile oil mixed with it, and along with it the most fluid part of the fat employed; the solid substance remaining in the boxes, is then taken out, and boiled a long time with water, to remove the odour of the volatile oil. It is afterwards kept in fusion for some hours, along with animal charcoal, recently prepared, and then filtered while boiling hot, and left to cool. This substance is then of a brilliant white, semi-transparent, and brittle, and without taste or odour.

This substance, though very fit for producing light, cannot, however, be employed for that purpose in this state, on account of its too great fragility, which neither permits it to be moulded, or to be moved about; a sort of ductility and tenacity can be communicated to it by a slight contact with chlorine, or hydrochlorine (mu-

* The patent to which the above letter refers, was obtained as early as 1825. We have not by us the volume of the Repertory in which it appeared, but the letter gives a sufficient outline of the nature of the invention. The reason for inserting it, is, to exhibit the fact of the existence of such a plan, to those who have, recently, applied for patents from the United States, for a similar invention, as this has occurred in several instances.—EDITOR.

riatic acid;) a fifth part of bees' wax, mixed with it, produces the same effect. It is then readily applicable to use, and candles can be moulded from it, which are as agreeable in burning as those made with wax.

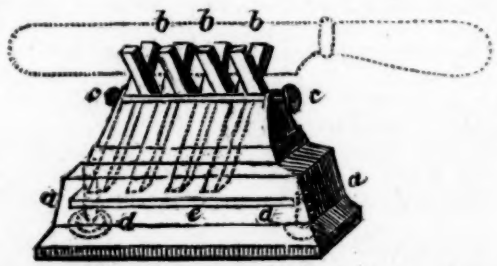
The oil expressed, or the more fluid part of the grease employed, containing, besides the volatile oil, which may be separated by distillation, a considerable quantity of the concrete matter, which it draws off and holds in solution, being purified and whitened by bone charcoal, is eminently fit for making excellent soap for the arts, and even for domestic use, its odour being weak, and not too disagreeable. This animal oil, first saponified by the potash of Vosges, is formed into a hard soap with a base of soda, by means of the sulphate of soda, which is of small value, and found abundantly in the saline waters of the departments.

This process has the advantage of affording to commerce sulphate of potash, sought for by manufacturers of alum.

ENGLISH PATENTS.

To FRANCIS WESTBY, *Cutler, for his invention of certain improved apparatus, to be used for the purpose of Whetting or Sharpening the Edges of the Blades of Knives, or other Cutting Instruments.* Enrolled July, 1828.

AN apparatus for sharpening edge tools, by means of two grooved steel cylinders, was the subject of a patent granted to J. Felton, in June, 1827. The invention now before us, is upon the same principle, but different in form. It consists of a box, containing several straight bars of steel, with file edges, which are fixed at acute angles, crossing each other; and the knife intended to be sharpened, being drawn to and fro with its edge downwards, touching the angles at which the steel bars meet, will become sharpened by the operation of filing.



The accompanying figure shows the apparatus in perspective; the dotted lines representing the parts within; *a*, *a*, is the box, or case, containing the steel bars *b*, *b*, *b*, which are placed alternately at opposite angles, crossing each other. These bars are held fast by the

screws *c*, *c*, which pass through the ends of the box, and bear up against the sides of the two outer bars, confining them all firmly in their places.

The edges of the steel bars are cut with fine grooves, extending lengthwise; and the knife introduced between the angles of the bars, being drawn to and fro, receives the operation of filing to a fine angular edge, which renders it thin and sharp.

In order to vary the angle of the steel bars, which will be sometimes necessary, according to the thickness of the knife, or other edge tool, required to be sharpened, the lower plate, or table *d*, on which these ends bear, must be raised or lowered. This may be done by turning the screws *d*, *d*, by which the moveable bottom, or plate *e*, is held up, and attached to the box.

As the file edges of the bars will wear away by use, they may be taken out of the box, and turned round, so that different edges may be presented at the angles, or their ends may be reversed.

Another contrivance of this kind for sharpening knives, has been invented by Messrs. Blake, of Sheffield. It consists of a series of these file edged bars, connected together merely by an axle passed through their centres, and may be set at any angle, and made fast by a screw. The contrivance is very simple, the cost but very trifling, and its use equally effective. EDITOR.

[*Newton's Journal.*

To LEMUEL WELLMAN WRIGHT, *Engineer, for an improvement or improvements in the construction of Wheel Carriages, and in the Machinery employed for Propelling, Drawing, or Moving Wheel Carriages.* Dated April 15, 1828.

THE principal object of this patent, is the application of compressed air to work machinery, by which carriages may be propelled.

The apparatus proposed for this purpose, is composed of two strong cylindrical cases, (apparently five or six feet long, and from twelve to sixteen inches broad,) with hemispherical terminations, for the reception of the compressed air, placed horizontally at the hinder part of the vehicle, below the level of the axle of the hind wheels; from which cases, pipes of communication pass to a third case of a similar form, fixed transversely behind them; from this, again, the compressed air passes through valves, to two cylinders, furnished with pistons like those of steam engines, and placed in a horizontal position; the piston rods of which act, by connecting rods, on cranks (at the opposite side of the same plane) formed on a horizontal axle, placed transversely, farther forward: from a wheel, or pulley, on which axle a band of leather, or of other proper materials, passes round another similar pulley, on the axle to which the hind wheels are fastened, and which, being made to revolve by the action of the cylinders, propel the carriage. The valves that admit

the compressed air to the cylinders, and convey it from them alternately, are worked by horizontal bars, that extend forward to rings, which surround eccentric wheels on the crank axle; and the air cases are filled through stop-cocks in their sides, either by being made to communicate with stationary reservoirs of compressed air, formed on a large scale, or with the forcing pumps, by which these are filled by the action of mill machinery, worked by a fall of water, the expansion of steam, or other convenient primary power.

To increase the force of the compressed air, the intermediate case, through which it passes from the others, is heated by tubes that proceed through it horizontally from a small furnace at the rear of the vehicle; and it is also mentioned afterwards, that the same effect may be produced by steam admitted into the working cylinders, along with the compressed air, from a small steam boiler fitted up in the ordinary manner; but, when this latter method is used, the intermediate air case will not be required.

The hinder wheels are represented of unusually large dimensions, and common horizontal springs, placed on their axle, support the hinder part of the carriage frame, which frame thence proceeds forward to the seat of the conductor in front; before this latter, a vertical shaft is placed, by means of which the course of the front wheels is directed in the following manner:—On the top of the shaft, a bevelled toothed-wheel is fixed horizontally, turned by another similar wheel that is worked by a *pair* of winches, according to the drawing; to the lower part of the same shaft, a pulley is fixed, round which a band, of any fit material, passes backwards to a similar pulley, on another shorter vertical shaft, at the bottom of which a drum, or pulley, is fixed, from which a band, or chain, extends at both sides obliquely to the different extremities of the front axle, close to the inner faces of the naves of the fore wheels, which are represented small enough to be turned round under the carriage frame; and, consequently, when the conductor turns the directing shaft either way, the connecting bands will draw the front axle obliquely in the same direction, and cause the carriage to move in the course required, in the ordinary manner.

The air engine, and carriage, are to be set to work, or be made to stop, by means used commonly for such purposes, which are so generally known, that the patentee has not thought it necessary to particularize them; and he only adds, on this head, that the carriage may be made to go slowly down hills, by having an air-pump fixed to it, to be worked by an eccentric wheel on the crank axle, which may be set in motion to fill the air cases, on such occasions.

Along the road, where carriages thus propelled are to run, large strong reservoirs of cast-iron are to be placed at regular intervals, which are to be filled with compressed air, by air-pumps, worked by any of the means before mentioned for the purpose, from which reservoirs the air cases of the carriages are to be replenished with compressed air, according as the carriages are brought up to their stations.

The seats for passengers on these vehicles, are represented, like

those of many stage coaches, to consist of a coach body of the usual construction, with an open hind body annexed to it, the latter of which is placed over the working machinery, and has appended behind it a small seat, at a lower elevation, for the man who attends the fire-place.

Towards the end of the specification, a rotary engine is described, which may be put in place of the working cylinders, first mentioned, and which consists of a flat cylindrical case, in which a cylinder of less dimensions turns round concentrically on an axle, that passes through the flat sides of the first, and is made air-tight in all its points of contact. From the central cylinder, two hinged flaps, or pistons, project at opposite sides, that closely fit the annular interval between it and the external case, and from the hinge of each of them, an arm projects at right angles, which, as the inner cylinder is impelled round, comes in contact with a roller on a pivot, attached to the case, that causes the flap to open out across the annular space, so as to meet the action of the compressed air that is admitted behind it by an entrance pipe, which forces it round until it passes the opening to the eduction pipe, that proceeds from the case at an angle of about 120 degrees from the former; it is subsequently pressed round into a cavity made for it in the face of the inner cylinder, by a curved inclined plane, inside the case, that extends to near the entrance pipe, and serves as a stop, or fulcrum, against which the compressed air may press while acting on the impelling flaps.

The patentee in concluding, very properly states, that in the apparatus described, he only claims the peculiar application of the parts to the purposes mentioned, or, more particularly, to the propelling carriages, by means of compressed air, having its force increased by the application of an elevated temperature; and he also mentions, that the vehicle may be used either for carrying passengers and goods, or for *drawing after it other carriages.*

Obs.—Some unaccountable fatality seems to attend the numerous attempts of the many individuals who have recently obtained patents for propelling carriages by engines, that has, hitherto, prevented their success, but as we think the object for which they are designed, to be very beneficial, we hope the present patentee will, in a great measure, accomplish it, by avoiding the errors of his predecessors, of some of which, from the last statement in the account of his invention, he appears to be duly sensible.

The idea of using compressed air for working machinery, originated with Mr. Medhurst, whose first patent for this object, in 1799, may be seen in our fourth volume, p. 406, second series; but, as Mr. Wright has improved on it, by increasing the force of the compressed air by heat, he, perhaps, may make it produce a more profitable effect than the original patentee has, whose first exhibitions that we witnessed, at the date of his patent, were as far from promising, as they have since been from performing.

Much advantage would arise from the great lightness of which Mr. Wright's apparatus is capable, if it could be made to perform

for an effectually useful distance; but of this, though we have great doubts, we hope a fair trial may be made to determine the point, esteeming the object to be extremely worthy of the experiment.

[*Repertory.*

To John Evans, *the younger, Paper Maker, for improvements in Steam Engines.* Dated January 15, 1828.

The steam engine described in the specification of this patent, is of the rotary kind, and is made to revolve by means of two cylinders, attached to a horizontal axle, one of which is fastened to it permanently, while the other is capable of a sliding motion along it, but is made to act on it by a rib that projects from the former, that enters into a longitudinal groove, cut in the part of the cylinder which surrounds the axle. These two cylinders are enclosed by a hollow cylindrical case of a sufficiently larger diameter, to leave a space all round between them, for the passage of a hinged piston, the breadth of which space is represented in the drawing to be about a tenth of the radius of the case. A diaphragm, or partition, is fixed in the case transversely, between the two cylinders, and circular lids are placed at their external ends, which come close to the internal circumference of the case, at their edges, but are so chambered off beyond them, as to retain a ring of hemp-stuffing, or gasket, all around, against each of which a deep metal ring is made to press by means of a flanch that projects from it, which is drawn by screws and nuts towards the flanch on the end of the extremity of the case next to which it is placed, the ends of the two internal cylinders being ground to fit the diaphragm and the two lids, so as to be steam-tight; and one of these cylinders being made to slide along the axle, the action of the screws on the flanches, besides closing in the hempen stuffing, presses also the lids against the external ends of the cylinders, and thereby forces their internal extremities against the opposite sides of the diaphragm, so as to prevent any steam from passing between them. To form a stop, or abutment, for the action of the steam in impelling the hinged piston, (that is attached to each of the internal cylinders, so as to occupy the section of the spaces between them and the external case,) a longitudinal opening of small breadth is made through the side of the case over each of the cylinders, enclosed by projecting flanches, into which openings, rectangular bars of brass are fitted, so as to come closely in contact with the internal cylinders. Outside the brass bars, hemp stuffing is placed, with iron plates of the shape of the openings beyond them, which are pressed towards the cylinders by several screws, that pass through a bar which is retained parallel to them at a due distance, by pieces that connect it with the sides of the external case.

Not far from these steam-tight stops, apertures are made through the case over each internal cylinder, for the admission of the steam,

and above them valves are fixed, in boxes in which sliding valves are worked, (so as to open and shut the two apertures alternately,) by rods that pass through stuffing boxes in their sides, to the different ends of a balance lever, whose centre of motion lies in the middle between them; and which is moved back and forwards in the direction of the valve-rods, by a connecting bar, that joins it to a ring, which surrounds an eccentric wheel attached to the axle of the engine. At the opposite side of the stops, pipes proceed from the spaces between each cylinder and the case to the condenser, which latter is not particularly described. There are no means mentioned by which the sides of the hinged piston may be kept steam-tight, or by which it may be opened or closed, and so little is said of it, that it is from the drawing alone we know that it is intended to be hinged; but notwithstanding this great imperfection, we can comprehend the peculiar mode of action of the engine, to consist in the steam first impelling one of the cylinders by its piston a certain portion of a circuit, and then passing off to force round the piston of the other internal cylinder, so as to complete the revolution, while, at the same instant, the steam that acted on the first cylinder, is permitted to proceed to the condenser, by its piston having passed the opening of the pipe of communication; and as one of the two pistons is always acted on by the steam, while the other is passing under the stop, or abutment, the revolving motion of the axle is made continuous; that is, supposing some contrivance to be added to the engine, for making the hinged pistons rise up again, after being depressed by the abutments, so as to occupy the space between the cylinder and the case, as they did previously. The patentee, besides what we have mentioned, describes a deep longitudinal cavity, which he calls "a sink, or well," made in each cylinder, from its surface to near its centre, immediately behind each of the hinged pistons, which is covered by them, only when they are pressed down by the abutments. These cavities are intended to increase the action of the steam, under the erroneous idea, that it will act alone on that side of them which is underneath the hinge of the pistons; and they appear to us to be not only useless, but injurious to the engine, in several particulars. [*Ib.*

To William Percival, *Veterinary Surgeon, for improvements in the construction and application of Shoes, without nails, to the feet of Horses and certain other Animals.* Dated January 19, 1828.

These improvements consist of additions to the common frog-bar horse-shoe, and of ligaments, or bands, by which it is to be fastened to the hoof of an animal.

The frog-bar shoe, is composed of the front portion of a common horse shoe, comprising about a third part of the whole, to the middle of which, a piece of iron in the shape of the letter Y is welded

by the lower extremity, so that its diverging parts pass out at each side, where the hinder extremities of the hoof terminate. To the end of each of these diverging parts, a double ring is fastened, in the improved patent shoe, and to the middle of the toe part at its outer edge, a flat narrow piece, (like the hasp of an outside box-lock) is jointed, which turns up over the front of the hoof about half its height, and has, at its upper part, two narrow staples placed successively, which serve to keep the two folds of the ligature separate, and in their proper positions, that are wound round the lower part of the hoof. This ligature is composed of strong hemp web, about three-quarters of an inch broad, as represented in the drawing, and is long enough to pass twice round the hoof; it is furnished with a buckle, and when applied to use, is first passed through the lower heel ring of the shoe at one side, then brought through the lower staple of the front hasp, and along the other side of the hoof to the opposite lower heel ring, and, after going through it, is brought back again through the upper staple of the clasp, to meet the buckle on its other extremity, by which it is fastened tightly at the side of the hoof. A second ligature of the same fabric is provided for the upper part of the hoof, and back part of the pastern, which is furnished with two flat narrow pads, one of which lies at the upper edge of the hoof in front, and the other at the hinder part of the pastern, just above the heel; this last ligature passes through the upper heel-ring of the shoe at one side, then goes round the back of the pastern, close above the heel, down to the opposite upper heel-ring, and finally comes over the upper edge of the hoof in front, to the buckle at the other extremity, by which it is fastened close to the hoof, in the same manner as the first ligature; in which position it prevents the shoe from moving forwards beyond the hoof, while the first ligature, in conjunction with the clasp in front, keeps it from being driven backwards out of its due position. Where the folds of the last described ligature cross each other above the heel-rings, a flat sliding loop of metal is passed over them at each side of the hoof, to keep them more steadily in their proper places.

A clause near the conclusion of the specification, states that the sort of shoes mentioned, may also be used for asses, and for mules, as well as for horses.

Obs.—As the patentee has not explained his reasons for preferring the frog-bar shoe, (which only covers part of the toe of a hoof,) for the basis of his improved shoes, to an entire shoe of the common form, which protects the whole hoof, we may be the better excused for not being able to comprehend what may be his inducement; and own we feel inclined to prefer the latter combination.

But still it appears to us, that a shoe even of this last kind, secured as the patentee directs, would be too liable to accidental displacement laterally, and, therefore, we would recommend the addition of hinged clasps to its sides, similar to the one directed to be placed in front, and that they be fastened on by the same ligatures.

Shoes of this description, can be carried by riders without inconvenience, and would frequently be very useful in situations where horses must be occasionally used at a distance from blacksmiths.

[*Ib.*

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS GRANTED IN MARCH, 1829.

With Remarks and Exemplifications, by the Editor.

1. For a machine for *Grinding Paints*, called the "Trumpet Mouthed Paint Mill;" Samuel Cook, Mendon, Worcester county, Massachusetts, March 3.

This is altogether a very compact, neat, and simple machine, and one which appears likely to fulfil the intention of the inventor, in a very perfect manner. One of the mills, of the ordinary size, has been sent to the patent office as a model.

The grinding is effected between rubbing surfaces of cast-iron. The mill receives its name from the form of one of these pieces of cast-iron, which exactly resembles that of the mouth of a trumpet, or French horn. This piece is about six inches in diameter, turned quite smooth within, and fixed to a frame, so that the plane of its edge shall stand vertically. The paint to be ground, is conducted to the centre of this piece, by means of a funnel, or hopper, which terminates in that part of it which would be the commencement of the tube, were it a trumpet. Into this hollow trumpet piece is fitted another circular piece of cast-iron, of nearly the same diameter, and which is made to touch the former, excepting at the centre, and in the spaces left for the reception and conducting of the paint; these spaces consist of two twisting grooves about an inch wide and a quarter of an inch deep, extending from the centre, to within half an inch of the outer edge, that part being left perfectly smooth. This second plate is made to revolve by means of a wheel and pinion, and there is, upon its lower edge, a spring scraper to remove the paint as it is ground. By means of a hinge, uniting the frame work of the mill, the two plates can be very readily separated from each other, for the purpose of cleaning them; and a thumb screw and nut secures them when together, and regulates their pressure.

"The peculiar excellency of this machine, and the object of the exclusive claim, are, the shape of the plates, by which the friction, so far as respects the effect on the mill, wears them nearly the same at the less, as at the greater diameter."

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2. For a *Lamp*, and ingredients for burning therein; Isaiah Jennings, New York, March 3.

The ingredients proposed to be burned in this lamp, are, 1st, oil, mixed with spirits of turpentine, three parts of the former, and one of the latter; 2nd, rosin, or turpentine, mixed with oil, one part

rosin, or turpentine, and seven parts oil, or other grease; 3d, any kind of hard grease, mixed with oil, by heating them together, in sufficient quantities to bring it to a soft state.

The lamp to contain the oil, or composition to be burnt, is either a spherical, or other formed vessel of glass, with two perforations; one below, for the admission of the tubes upon which the wick is placed, and one above, for the flame and heated air to pass through. The lower opening may be an inch and a quarter in diameter; into this is fitted a perforated cork, through which passes a tube $\frac{3}{4}$ of an inch in diameter, capable of sliding, or screwing up or down, through the cork. This tube may reach to the centre of the spherical glass, or may be passed up so as to be even with the top opening, of $2\frac{1}{4}$ inches in diameter, and surmounted by an ordinary burner. The tube may be made of brass, and on it is to be slipped loosely, a circular, or tube wick, which shall stand even with its top. A second tube, formed of earthenware, soap-stone, or any other imperfect conductor of heat, is then dropped over the wick. This tube is perforated in many places, to allow the oil, &c. to pass readily to the wick, and extends up to the height of the brass tube. When the flame is to be increased, the inner tube is to be depressed, so as to stand below the top of the outer tube. There is no contrivance for raising the wick, the depression of the inner tube, it is affirmed, producing a similar effect.

"What I claim as my invention, is, a tube passing through the bottom of the lamp, to be raised and depressed by a screw, or otherwise; the method of placing the wick even with the top of the tube; the tubes, or noses, of materials that are called 'non-conductors' of heat; and the compound ingredients for burning in the lamps."

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3. For a machine for *Packing Cotton Bales, Tobacco Hogsheads, &c. &c.;* Tyre Jennings, Statesburg, South Carolina, March 3.

This press is worked by a long lever, the centre of which forces down a follower, under which the article to be pressed is placed. In the actual press, this lever is stated to be 67 feet long, and to project beyond the frame of the press, 30 feet on each side: these arms are to be operated upon alternately. Strong cross bars extend horizontally from one side of the frame of the press to the other, like the rounds of a ladder. The fulcra of the lever are formed by passing moveable pieces of timber between these bars, above the top of the lever, on each side of the shaft of the follower, alternately. These pieces may be placed nearer to the centre of the lever, as the pressure proceeds, and it becomes necessary to increase the power. The lever, from its great length, requires to be braced, or trussed, or its elasticity would interfere materially with its action.

The whole structure appears to us to be extremely inartificial. The constant removal of the cross timbers, on either side, as the follower ascends, or descends, requires too much manual labour, and that of a kind which it is inconvenient to perform, and which would

scarcely be resorted to excepting where slave labour was principally depended upon. The same principle, under a much more convenient arrangement, is known to mechanicians, as applied to the press. Within the cheeks of the two upright posts of the frame of a press, are fixed iron racks; and upon the lever there are catches which take into the teeth of these racks, so as alternately to form fulcra, as the arms of the lever are drawn down.

The patentee claims the whole machine, as described by him.

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4. For *Nail Hammers;* and others, with draw, or pene; Charles A. Strong, Chatham, Connecticut, March 3.

The whole specification is as follows:—"The hammers are to be made of cast-iron, and cast in moulds fitted for that purpose, in the usual form or manner of other castings, with the face of the hammer against a plate of iron, which hardens it. They are then ground on the face and polished on an emery wheel, in the usual manner."

"What I claim as new, and as my own invention in the above manufacture, is, making the hammer of cast-iron, and hardening the face against a plate of iron; and a projection of about one-fourth of an inch on the inside, around the eye, which gives great strength to the handle, and beauty to the shape."

"The great advantages of the manufacture in this way, are, that they are more beautiful, admit of a higher polish, and can be afforded cheaper than wrought iron ones, and are equally durable."

On the 31st of July, 1828, a patent issued to Thomas Jones of Glostonbury, Connecticut, for a similar object. In this specification, hammers are directed to be moulded as other articles are moulded for casting. To harden the face, a piece of iron weighing about a pound, is to be placed in the mould, and a smaller piece for hardening the claw. They are to be ground and polished, and are then ready for use. The perfect similarity of the two patents is apparent.

We are at a loss to know upon what ground the patentees rest their claim, as they have not stated it in their description. Cast-iron hammers have been made for various purposes, and, indeed, there are but few articles for which wrought iron and steel were formerly employed, which have not been imitated in cast-iron, as it can be made either hard, soft, or malleable, as may be desired. The term "chilled cast-iron," is familiar to machinists; cast-iron suddenly cooled by being cast in iron moulds, or against masses of cold iron placed in a mould of sand, is so called.

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5. For an improvement in the mode of *Grinding Steel Dies* used in the manufacture of metal buttons; Willard Robinson, Attleborough, Bristol county, Massachusetts, March 3.

"Dies for stamping buttons, are made of hardened steel of a cubical shape, one side of which being formed to the figure intended to be impressed, and to the shape intended to be given to the button.

This process has, heretofore, been effected with the use of the graver and lap; a mode slow of operation, and subject to inaccuracies. My improved method of making said dies, is simple, much more perfect, and more especially so, when a rim perpendicular to the face of the button is to be raised upon its edge."

After these preliminary remarks, the patentee states that the first steps in forming the die, are the same as those heretofore known; that is, the cubical block is fixed in a chuck in the lathe, with its face side sufficiently exposed to be turned nearly to the form intended, by means of the graver, after which the improved apparatus is to be employed for giving an accurate finish. This apparatus is called the "graduated button rod," which is made and used as follows:—

There is a rod of iron, steel, or other metal, about half an inch square, and from three inches to several feet in length. This rod has indentations made by a prick punch, on opposite sides of it throughout its whole length, and at small distances apart. One end of it is drilled to the depth of an inch, to receive a piece of copper, or other metal, called a *fit*, which, by the aid of emery and crocus, serves to grind and polish the die. A front centre, or head, capable of sliding upon the bar of the lathe, has a perforation, or mortise, through which the rod may pass, and sufficiently large to admit of the motion which it is to receive. By means of a steel point projecting upwards, and an adjusting screw through the top of this head, the rod may be confined so as to vibrate laterally, in consequence of the points taking into opposite prick punched holes; the distance from the set being regulated according to the concavity of the face of the die.

A rest, standing in front of the die, supports the end of the rod, containing the *fit*, and serves as a guide in moving it backwards and forwards.

There is a sort of hinge joint in the front head, to admit of raising the rod, to examine the die, without the necessity of altering its adjustments.

"Although my said improvement is intended principally to be used in the formation of steel dies, for stamping buttons, it may also be usefully applied to the purpose of grinding concave mirrors of glass, or metal, also for optical glasses."

Without intending to intimate that a suggestion like the foregoing would vitiate the patent, we will observe that the validity of these instruments is frequently endangered by the desire to claim as much as possible. The safe course in all cases, is, to claim no more than the essential features of the new machine, as applied to purposes with which the patentee is familiar. We have no doubt, that an arrangement something like that described, has been applied to various purposes in the lathe. The two large brass mirrors made for Dr. Hare, of Philadelphia, and used by him in his experiments on the radiation of heat, were, at the suggestion of the Editor, turned and ground to a true curvature, by tools fixed upon a rod, and vibrating like that used for grinding the dies as above described. These were made in the year 1819.

6. For an improvement in the mode of *Making Bricks, Tile, or other Clay ware;* James Wood, Haverstraw, Rockland county, New York, March 3.

(See specification.)

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7. For a *Machine for Grinding Clay and Sand together,* and making the same into brick, at one operation, without the application of water; Alfred Cushman, Sumner, Oxford county, Maine, March 3.

The description of this machine is not given with sufficient clearness, nor its parts represented in the drawing with sufficient distinctness, to enable us fully to understand it; we must, therefore, explain it in a very general way.*

A vertical shaft with a spur wheel on its lower end, is to be turned by horse, or other power: this spur wheel takes into a smaller wheel on a vertical shaft, which passes through the hopper, in which has been put the clay and sand, loosely mixed together. The structure of the grinding part is not described. The clay is taken with no more moisture than it ordinarily contains, and when ground, is said to be sufficiently adhesive to form a fair brick by heavy pressure, and sufficiently dry to be put immediately into the kiln. The moulds for the bricks are to be made of cast-iron; these are placed under plungers, or followers, faced with iron, which are forced to descend by the action of horizontal arms which project from the upper part of the main vertical shaft; these, by means of rollers acting upon inclined moveable pieces of timber, force down the followers, and press the bricks.

The patentee does not state any particulars which he claims, but gives a general description of the machinery.

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8. For a machine for *Raising the Bodies of Wagons and other Carriages, from their Wheels,* and lowering them down again to their places; Thomas Scott, Louden, Franklin county, Pennsylvania, March 3.

A strong frame is erected, open at two opposite sides, like weigh houses for wagons. Two rollers turning on gudgeons, in collars,

* It is the practice of the superintendent of the patent office, to give such advice to applicants for patents, as may appear to him most likely to promote their interest, and also to demand models of patented machines, in general, to be deposited in the office, as, from them the views of the patentee may frequently be much better understood, than by such descriptions and drawings, as persons living in remote parts of the country, are able to furnish. In relationship to the two patents, Nos. 6 and 7, as well as to many others, he has been deprived of the opportunity of performing what he conceives to be his duty in this respect, by a person who was lately a clerk in the patent office, having unjustifiably passed many papers, through the forms of office, without submitting them to the superintendent, and who has, consequently, not known of their existence until after they had issued.

cross the upper part of this building. From each end of these rollers, a rope descends, which is looped at the lower end to receive a pole which is passed under the body of the wagon. On one end of each roller, there is a whorl to receive the rope by which the roller is to be turned. On one side of the frame, and immediately under the whorls at the ends of the rollers, there are two windlasses, with their cross bars, ratchets, and catches. From each of these windlasses, a rope passes round one of the whorls of the rollers, and by the aid of the two, a wagon, with its load, may be readily raised.

The patentee says, "I do not claim as my invention the above described rollers, or the wheels, or wrench, or ratchet, or hand; but I claim as my invention and improvement, the above described application of the wrench and rollers, as arranged, for the raising of the bodies of wagons and other carriages, whether loaded or not."

This, like many other patents, appears to have been obtained under a very prevailing, but, we think, a mistaken idea, that a patent can be sustained, excepting proof can be given that the same thing has been used in the same way, and for the attainment of precisely the same end, to which the patentee proposes to apply it.

Were it proposed, directly, to take out a patent for raising up a wagon by a common windlass, which has been universally employed for raising heavy weights of all kinds, the absurdity, we think, would be manifest; what more is done in the present instance, we do not perceive. If the merit is in the arrangement, this is so easily changed as to offer no security whatever; thus, in the foregoing machine, the end of each roller might have the windlass applied directly to it, without the intervention of the whorl and rope, and this, without being either a *discovery*, or invention, would, probably, be a better arrangement than that adopted.

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9. For an *Instrument for Tuning Piano Fortes*, and other musical instruments, denominated the CROMAMOMETRO; Peter Pettinos, Philadelphia, March 3.

This instrument is a monochord, or instrument of one string. By means of a screw, and a sliding brass box at one end, this string is strained up to the proper pitch. The whole instrument is somewhat in the form of a long, narrow guitar; upon its handle, a brass scale is screwed, so divided, that when a sliding piece is made to stop the string at the respective divisions, it will give the notes through an octave, of the proper temperament for a stringed instrument. At one end of the instrument, there is a key which causes a hammer to strike the string.

When used, the *Cromamometro* is to be placed on the piano forte, or other instrument, and with one hand the person strikes, simultaneously, the key of the cromamometro and piano; the moveable bridge being adjusted, successively, to each note on the scale; after which, nothing remains but to tune the remainder of the instrument by octaves.

10. For a machine for *Straight and Spiral Reeding and Fluting;* John January, Greenville, Kentucky, March 3.

This machine, which is intended to reed and flute bed posts, &c., is constructed much like some of the machines for cutting the grooves in rifle barrels. A bench is made, somewhat like a lathe, having between proper heads a cylindrical piece of wood, upon which may be cut straight or spiral grooves. A sliding frame has at one end a guide piece, which takes into one of these grooves, and at the other a cutter, which operates upon the piece to be wrought, this being so attached as to be carried round by the motion of the grooved cylinder; there is, of course, a dividing plate, and other necessary appendages. The general arrangement is claimed.

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11. For a *Press for Cider*, and other purposes; Daniel Reed, Easton, Bristol county, Massachusetts, March 3.

This press bears a strong resemblance to some others which we have seen, both patented and unpatented. Two upright cheeks are framed into sills. Two levers, which are drawn down by means of ropes, or chains, from two windlasses on the outside of the cheeks, force down two plungers, or sliding blocks, which act upon the pressing plank, or follower. As this is forced down, it is kept in its place by palls, or catches, which take into a rack within each cheek of the press.

There is a third windlass, with ropes, for the purpose of raising the levers, and thus taking off the pressure. The claim is to the general arrangement.

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12. For a mode of *Constructing a Tan-yard, and Tanning Leather;* Leonard B. Johnston, Tompkinsville, Monroe county, Kentucky, March 3.

The vats are to be so constructed, with tubes near their bottoms, connecting one with the other, so that the ooze can be conducted through, or stopped off, by means of a plug.

Within the vats on opposite ends, there are rows of wooden pegs, placed at about four inches from the top, and one inch apart; upon these the leather is to be hung, in certain parts of the operation of tanning.

The latches are made to communicate with the vats, in the same way as the latter communicate with each other.

We do not know what novelty there may be in the proposed arrangement; there, however, are tan-yards which have been long provided with means of communication from one vat to the other, which strongly resemble that described. The claim is as follows:—

"What I claim as new in constructing a tan-yard, and tanning leather, is the construction of the latches, tubes, and pins in the vats to hang the leather on; and the whole mode of tanning as stated in the specification."

13. For *Canal Boats*, to be propelled by steam power; Benajah Williams, Mendon, Monroe county, New York, March 3.

"The improvement consists of two boats, connected by one deck. These boats are to be built with the ordinary curvature outside, but straight throughout on the inside. In the space between these two boats, is the wheel by which it is propelled, by ordinary steam machinery, placed within the two boats. If necessary, two wheels may be used, by having additional machinery of the same kind."

The foregoing is the whole of the specification. We apprehend that the plan will not fulfil the condition of being *new* and useful.

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14. For *Manufacturing of Woollen Carpet or Carpeting*, by which the carpeting is manufactured without spinning, or weaving; William Harrington, Harrison, Westchester county, New York, March 3.

The specification of this patent refers, throughout, to the accompanying drawings, but the petition contains a very clear and ample view of the leading features of the invention, which we subjoin.

"The wool is first picked in the same manner as it is commonly prepared for carding rolls, then carded in a carding machine of the same kind as is used to card rolls, except the finishing doffer of the carding machine, the whole surface of which is covered with filleting cards, and from which finishing doffer the wool thus carded is separated by a moving comb, (such as is used in carding rolls,) and comes off in a thin web, which is received upon a wooden drum, standing within five or six inches of the end of the carding machine, upon which this web of wool, by the turning of the drum in an opposite direction to the doffer, is wound one web upon another, till it becomes of sufficient thickness for the carpeting. When this bat of wool, thus formed and pressed together (by a roller over the drum, under which it passes each time the drum goes round,) is of sufficient thickness, it is cut by a pair of shears, lengthwise of the drum, and by the motion of the drum turns off, and is succeeded by another formed in like manner. After a sufficient number of these bats of wool are formed, in the manner above mentioned, to make a piece of carpeting, they are joined together by picking off about half the thickness of wool at one end of each of the bats intended to be joined together, and lapping one end upon the other, and pressing them with the hands till they adhere together, and appear smooth and even at the place where they have been thus united. The piece thus formed is folded into linen cloths, so that each layer, or fold, is separated from the other by the linen cloths, and the outside of all the folds also, covered with the same; in this situation it is placed in a wooden box, resting on coarse linen cloths moistened with water, which cover a cast-iron plate, over a furnace of brick, which heats the plate, and with the lid of the box closed, is steamed about twenty minutes. When sufficiently steamed, the whole piece in the linen cloths is taken from the steamer, and placed upon a table under a large wooden pad (upon which rests a weight of fifty-six pounds, or

more, if necessary to increase the pressure) which pad is moved horizontally across the folds of the piece by a crooked iron crank turned by water; and in the space of about half an hour, will harden the whole piece, and make it nearly as strong and firm as flannel before it is fulled. After it is thus hardened, the piece is removed from the linen cloths, and fulled in the fulling mill, in the same manner as flannel and cloth usually are, with soap and water; it is then washed with water in the fulling stocks, taken out, and dried upon tenter bars. The piece of carpeting is then sheared in the same manner, and by the same machinery, as cloth is, usually; then cold pressed to make it smooth; the edges trimmed; when the carpeting is white and smooth, and is prepared to have the different colours and figures stamped upon it by the dyers and printers."

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15. For *Machinery to be used in Navigation*, chiefly applicable to the propelling of ships, and other floating bodies, and some of which improvements are also applicable to other purposes; Adolph Heilbronn, New York, March 16.

This patent is for an improvement on the paddle wheel; for an advantageous mode of applying human power to the working such wheels; and for an improvement by means of which vessels are to be prevented from making so much lee-way as usual. This patent we shall hereafter present more at large than we are now prepared to do, and, probably, with illustrative engravings.

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16. For conveying commodities, goods, wares, merchandise, produce, &c., upon *Roller Ways* or *Roads*, by means of carriages adapted to run on said ways, or roads; John Gardiner, Washington, D. C. March 16.

This is a patent for running rails upon wheels, instead of wheels upon rails. Posts, or standards, are to be put into the ground, in rows, near to each other. Rollers with rims are to revolve upon gudgeons at the tops of these standards. The carriages are to be made with runners, like the runners of sledges, or sleighs. The patentee calculates that this plan will be very *economical;* more durable than the ordinary rail road; less subject to injury from frost, or to being obstructed by snow, and very convenient to the farmer, who can make his own carriage, "for little or *nothing*." The carriages may also cross, or navigate, rivers which may be in the course of the road; it being only necessary in this case that "the carriages be built like scows, or gondolas."

Notwithstanding all the advantages enumerated by the patentee, we are apprehensive that there will be an *obstinate* perseverance in following the old plan, on the part of those interested in the construction of rail-roads.

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17. For an improvement in the *Setting of all kinds of Boil-*

ers, for consuming the Pennsylvania anthracite, or any other fuel; John Lovatt, Philadelphia, March 17.

This specification describes the mode followed by the patentee, in fixing doors, dampers, bars, flues, floats, &c. &c. What is claimed is not stated, nor does it appear to us that he has in any instance separated the old from the new in his plans. There are numerous figures and references, which we do not think it necessary to give.

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18. For an improved *Churn;* Zuri S. Doty, Groton, Tompkins county, New York, March 17.

The body of this churn is in the form of the common upright churn. A vertical shaft passes through the lid, and into a cross piece above it. Upon that part of the shaft which is above the top of the churn, there is a small cog wheel, or pinion, which is turned by a vertical wheel, operated on by a crank, or winch. The dashers consist of thin slats, set spirally round the shaft, at an angle of about 45 degrees with the surface of the cream. The points claimed are not stated, but the advantages said to result from this arrangement, are, ease of working, and rapidity in producing the intended effect. The mode of turning is very old.

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19. For a machine for *Ascertaining the Rate of a Ship or other Vessel's motion* through the water, and also the velocity of tides; James D. Woodside, Washington, D. C. March 17.

This machine the inventor denominates a *Perambulator*. The choice of a name is not a happy one, as it is already applied to a well known instrument, and as relates to the machine in question, it is a misnomer. Many instruments have been invented for the purpose of measuring the velocity of tides and currents, and of ascertaining the way of a vessel, and patents have been obtained for several of them, both here and in Europe, some of which have been noticed in this Journal. Practice, the surest test of the operation of machines in general, has not so established the character of either of them as to have continued them in use; we do not now speak of the more recent attempts. Some of them, we thought, wore as fair an aspect as the one before us; may its course be more prosperous than theirs. The following are its leading features.

A water wheel has 4 wings so constructed as always to present their flat surfaces to the water on one side, and their edges on the other: these wings turning upon pins in brass rims, with suitable stops, in the manner of some horizontal wind-mills, and of many water wheels which are placed wholly under water. This water wheel is let into the stern post, about 12 inches below the water line. Its axis extends up the stern post, in a groove, which admits of its being covered by the copper sheathing, and reaches to the top of the rudder casing, in the cabin. An endless screw on the upper end of this axle, gives motion to a train of wheels, furnished with indexes to

point out the distance travelled, or rather the number of the revolutions of the water wheel.

The patentee states that the diameter of the wheel is 4 inches, and its circumference 12; (this is not exactly "according to Gunter:") that when placed in a tide, or current, it will move with its velocity, and make 5280 revolutions in a minute, this being the number of feet in a mile. The number of teeth in the wheels is calculated upon these data, which are manifestly erroneous, as a circle of 4 inches in diameter is upwards of 12 and a half inches in circumference; nor will such a wheel as this move with the velocity of the current, but must differ from it very considerably; the water operates with different degrees of force on the different parts of the wings; and the effective diameter will, therefore, be much below 4 inches: friction, the resistance of the returning wings, or buckets, and the actual loss from their turning, all conspire to impeach the calculation. We are of opinion that if the instrument prove to be good, the actual revolutions of the wheel, in relationship to the velocity of the water, must be ascertained by observation alone.

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20. For an improvement in the *Mode of Drawing Water from Wells, Cisterns, &c.*, for which a patent was obtained on the twentieth day of August, 1828; Samuel Smith, Mendon, Monroe county, New York, March 17.

We gave an account of the original patent in our last volume, p. 258. The present improvement appears to us to bring the thing back to the common pump, exactly. The patentee states, that he uses "the usual upper part of a pump, with a handle, shaft, tube, and boxes, in the usual way; but instead of sinking the log down into the well, or cistern, as is customary, a tube of metal, earth, or wood, is inserted into the well, or cistern, precisely as is described in the letters patent before adverted to; and the common pump head may stand in any place required." That is, if we understand the meaning, the pump need not stand directly over the well, but a pipe may lead from a kitchen into a well in the yard, and the pump be worked in the kitchen, as has been repeatedly done, time out of mind.

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21. For an instrument for *Sharpening and Improving Knives*, and other edged tools, denominated the "Carving Knife Renovator;" Isaiah Jennings, New York, March 17.

The principle upon which this instrument acts, is the same as that of the "Compound Guard, and Knife Sharpener," described p. 341; but instead of wheels, or disks of hard steel, intersecting each other, two pieces of flat hard steel are fixed in a block, from which they stand up, their flat faces touching, but their edges diverging from each other, so as to resemble the blades of a pair of scissors partially opened. Two or more pairs of these may be fixed in a line with each other, and the knife to be sharpened drawn through them.

The resemblance between this instrument, and one for which a patent has been obtained in England, by Francis Westby, will be seen by turning to the account of that patent in the present number; where will be found another modification of the same principle.

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22. For an improved plan of *Constructing Clocks;* Aaron D. Crane, Caldwell, Essex county, New Jersey, March 18. (See specification.)

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23. For an improvement in the *Power Loom*, in adding thereto an engine to weave figured cloth of every description; William Levally, Canterbury, Connecticut, March 18.

The power looms to be used are those of the ordinary kind. The improvement consists of an engine, on a part of which the intended pattern is formed in such a way as to act upon a lever, which, by the intervention of suitable machinery, serves as a guide to the pattern. When a new figure is required, a part which is suited to direct the machinery in forming such pattern, has to be prepared and in its proper situation.

The drawing and description do not enable us to comprehend the plan fully, and if they did, it is probable that an engraving would be necessary for their explanation. A model is to be furnished for the office, but has not yet arrived.

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24. For *Polishing Screw Augers;* David Bassett, Derby, Connecticut, March 18.

This patent is taken for the *manufacture*, and not for the machinery employed. The ordinary screw auger is to be ground true, and polished throughout, by means of stones and buffs, in the way well known to workmen. The patentee thus states his claim.

"What I claim as new in this invention, is the auger thus made by me, whether the brightening, smoothing, or polishing, be performed by the means aforesaid, or by any other means producing the same effect."

The advantages stated to result from polishing, are the lessened liability to corrosion, and the greater ease of working, from the facility with which the chip is delivered.

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25. For an improvement in *Rail-way Carriages;* Isaac Knight, Baltimore, March 18.

For the application of friction rollers and friction wheels, to rail-way carriages, several patents have been recently granted, and it is acknowledged by some of the patentees, that these plans are essentially the same, and that the validity of the claim of either must rest upon the proof of priority of *invention*, or rather of adaptation. For ourselves, we do not think that the merit of this question actually lies in so narrow a compass. Friction wheels are well known

applications among machinists, and it is certainly a question whether the employment of them in rail-road carriages can be called either an invention or discovery, although it may actually be an improvement. It is highly probable that the contending claims of those who have obtained or applied for patents for this application of the friction wheel, may lead to the determination of this point before the competent tribunal.

It does not appear necessary to say more about Mr. Knight's patent, than that it is for the employment of friction wheels above, and, sometimes laterally also, to the axles of rail-road carriages, to prevent the rubbing friction against the sides of the boxes in which the axles are to revolve. The specification concludes as follows.

"My invention mainly consists in the application and combination of the foregoing well known principles to the purposes of the transportation of goods, and all kinds of burthens and passengers on rail-roads."

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26. For the manner of *Forming the Spire, or Roll of Yarn, on a Weaver's, or Shuttle, Bobbin;* John Thorp, Providence, Rhode Island, March 18.

Several of Mr. Thorp's improvements will be made known in an early number, agreeably to our several notices to that effect. They are now in the hands of the engraver: the above will appear among them.

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27. For the *Manner of Cutting Ice,* together with machinery therefor; Nathaniel F. Wyeth, Cambridge, Middlesex county, Massachusetts, March 18.

The machinery for cutting ice described in this patent, consists principally of two distinct instruments, the first operating as a straight, the second as a circular saw, both to be acted upon by horse power. The first consists of a quadrangular frame of iron, about three feet in length, and twenty inches in width. Plates of steel, or of iron pointed with steel, are fastened along the two opposite edges of this frame, so as to project from, and stand at right angles with each side of it, forming the plough, or saw, with which the ice is first to be cut. At the first angle, this saw projects but one inch from the frame, and increasing an inch in each successive angle, projects four in the last. On each edge there are but four cutting points, or teeth, each cutting one-fourth of an inch deeper than that which precedes it.

This frame is to be drawn along upon the surface of the ice, when two grooves will be cut about twenty inches apart, and one inch deep. By turning the frame so that the saws may successively run in these grooves, they are cut to the depth of four inches. The field of ice is then crossed, and thus divided into squares, when the second instrument is to be used.

The second instrument consists of a two wheeled carriage; the wheels having iron teeth on their rims, to take hold of the ice, and

cause them to revolve. These wheels are firmly fixed upon a common axle; upon the middle of this axle is a toothed wheel, from which motion is communicated to a circular saw, at the tail of the carriage; this saw is about two feet in diameter. The whole is to be drawn like a plough, a man following, and by means of handles guiding, and depressing or elevating the saw.

"It is claimed as new, to cut ice of a uniform size, and by means of an apparatus worked by any other power than human; the invention of this art, as well as the particular mode of the application, are claimed by the subscriber."

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28. For an *Economical Cooking Stove;* John J. Hess, Philadelphia, March 19.

"This stove consists of seventeen pieces, or plates, independent of eight doors, and three grates, all resting upon four feet, which, when properly applied, and put together, form a perfect, whole, and entire construction, capable of performing, with rare economy, a great variety of cooking operations, together with numberless other services in housewifery, being heated by a very small portion of wood, or anthracite coal."

The foregoing is the exordium of the specification, and the following is its peroration.

"With this apparatus, and attentive care in its operations, great economy must be preserved in the consuming material used for fuel. Steam is generated from the boilers, and when received into proper vessels, can be applied to all the delicate cookery of luxurious dishes, without the aid of assistants; an important advantage to families. Boiling water is always in readiness; and with the same fire, baking of meats, and bread, or fruit, roasting, broiling, stewing, frying, boiling, and fricaseeing, are expeditiously going on, at one and the same time!" JOHN J. HESS.

There is a something so stimulating in the foregoing enumeration of properties and results, as to make us wish to anticipate the usual "hour of prime;" and had we one of Mr. Hess's stoves, we certainly should hurry the cook. As it is impossible to describe this stove without engravings, and as most of our readers, like ourselves, are more inclined to partake of a good dinner than to study the means of preparing it, we will merely give them the address of the patentee, who resides at No. 237 North Second Street, Philadelphia, who is prepared to gratify the *taste* of those who will apply to him.

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29. For an improved *Machine for Napping Cloth;* Moses R. Norris and Lyman Phillips, Covington, Genesee county, New York, March 21.

This napping machine, or gig mill, is furnished with three different cylinders, either of which may be placed in the frame, according to the nature of the work to be performed. One of these cylinders is to be covered with "common machine cards, cut or made in strips lengthwise, say one and a half inch wide, so that they will work

sideways to the cloth, which causes it to work tender, and not damage the cloth;" or the card teeth may be set straight. The second cylinder is covered with teazles, and the third with brushes. There are also what the patentee calls "canting raising spreaders," for the purpose of spreading the cloth as it passes in either direction.

The machine is not very clearly explained, or the difference between it and others very distinctly stated. The claim is, "the frame, or manner of constructing it. Straight teeth on the card or cylinder. Canting raising spreaders. The manner of shifting the machinery. Manner of driving the gearing by the main band. Extra cylinders."

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30. For *Ornamenting Picture, Looking-Glass, and other ornamental Frames*, called "the Jackson Ground;" John Parker and Lewis P. Clover, New York, March 23.

(See specification.)

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31. For an improved *Salt Pan;* William Blocksom and John T. Fracker, Zanesville, Muskingum county, Ohio, March 23.

(See specification.)

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32. For a pattern for *Moulding and Casting Composition Spikes*, butt bolts, and other castings; Joshua Sewall, and Charles Sewall, Bath, Lincoln county, Maine, March 25.

A plate of metal, of any suitable kind, from one-eighth to half an inch in thickness, is cast with one-half of the pattern of the spikes on each side; these half spikes standing anglewise, to deliver well from the sand. This plate is made to suit the size of the flasks to be used, and fitted to the dowells, or pins, which cause the flasks to match. To those who understand any thing of casting, the mode of using it will be obvious.

The patentees "claim as new, the method of making the above described plate, or pattern, for casting, with the sections of the spike on each side thereof, so exactly corresponding as to give the perfect shape of the spike, and so fixed upon the plate as readily to draw from the sand. The method of moulding spikes by the pattern, by which the spikes may be cast with points as wide, or wider, than the shanks, and which will, consequently, draw better than spikes moulded by pricking in the pattern, or moulded in any other way now known to be in use. The advantage of having the sections of the spikes so affixed to the plate, that they present on each side of the pattern, a half of the spike from corner to corner, with the point on the one side of the plate indented, and on the other side raised, so as to give the perfect shape of the spike when cast. Also the great saving of time and labour in moulding with the above described plate, or pattern."

The indentation and raising, mentioned, relate to the form of the mould, which is necessary, in consequence of the widening out of

the end of the spike. The latter part of the claim, is, we apprehend, mere surplusage, as the saving of time is scarcely a patentable article; and the means by which this is accomplished, had been already claimed.

We have seen the half patterns of spikes fixed upon mould boards; not upon the opposite sides of the same board, but upon two separate boards; this is the nearest approach to the plan of the patentees with which we are acquainted.

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33. For apparatus to *Prevent Wind, Water, &c. from Driving under Doors;* William Cole and John Johnson, Randolph, Norfolk county, Massachusetts, March 27.

A strip of wood, or metal, plays loosely in a groove under the rail of the door; this strip is kept up by a spring when the door is open; by shutting the door, a lever is made to act upon this spring, and to force the strip down upon the floor, or sill. It is stated that the other edges of the door may be guarded in a similar manner.

In the plan adopted, the lever, with its appendages, is fastened upon the centre of the lower rail of the door, and occupies nearly its whole width, and would be, generally, accounted an eye-sore. We have seen a plan in which a similar strip was employed, and forced down by a wire which shot out to the distance of about half an inch, just above the strip at the back edge of the door, where it could scarcely be discovered. This wire, on shutting the door, was forced in by the rebate of the door frame, and caused the strip to descend.

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34. For the discovery of a *Water Proof Cement*, or hydraulic lime; Robert Leckie, Washington, District of Columbia, March 31.

The specification will appear in the next number.

Specifications of American Patents.

Specification of a patent for Making Bricks, Tile, or other Clay Ware. Granted to James Wood, *Haverstraw, Rockland county, New York, March* 3, 1829.

Take of the common Lehigh coal (or coal of any other kind which is found not to swell in burning) such quantity as will best suit the kind of clay about to be moulded into brick, tile, or other clay ware when mixed with it, (that is, the clay,) after the coal being completely and finely pulverized, in any way or manner that may be found most convenient by the manufacturer.

There are no particular proportions of the clay and pulverized

coal to be used in making these brick, tile, or other clay ware; these depend upon the nature of the clay to be used.

The finer the coal is pulverized, the better it is, invariably, found to answer for this mode of making bricks, &c.

Any kind of coal may be used, with the exception of such as swells in burning. These bricks, &c., are burned in the common way, but they require a much less quantity of wood in the process of burning, than those brick, &c., which are composed of clay alone. Brick composed of these ingredients, are of a better colour when burned, than the common clay brick. JAMES WOOD.

Specification of a patent for an improvement in the plan of Constructing Clocks. Granted to AARON D. CRANE, *Caldwell, Essex county, New Jersey, March* 18, 1829.

BE it known that I, the said Aaron D. Crane, have invented a new and useful improvement in the making of clocks, which invention is as follows. This improvement, in the time part of the clock, consists in making it with only two wheels. One wheel with a barrel, similar to that of a common clock, only much smaller; this wheel drives a second wheel, which has pointed teeth, like those of the swing wheel of a common clock. The teeth of this wheel work on a small pallet, projecting from an arbor, on the back end of which is fixed a rack with twenty-nine teeth. The wheel acting on the pallet of this arbor, throws the rack back, when the wheel is locked, and the rack is carried forward by a light weight attached to it, and the teeth of the rack, acting on a pallet on the arbor, to which the stirrup, or guide, is fixed, keeps the pendulum in motion.

The pendulum rod is about six inches and a half long, with a very light bob, and has a balance attached to it, consisting of a slender bar about ten inches long, with a weight of six ounces at each end.

The striking part has only one wheel, which has pointed teeth, which works on a pallet in the hammer arbor, and causes it to strike the hour; and the time between the strokes is regulated by a balance attached to an arbor running through the clock, with a pallet working in the teeth of the striking wheel.

The hour is struck on strings of wire, or cat-gut, drawn over a box of thin boards about two feet long, and three inches wide.

The hands are carried without wheels. A pipe, or socket, slips into the arbor of the centre wheel, to which the minute hand is fixed, and on the back end of the pipe is fixed a spiral piece of brass, which, as it revolves, raises a hook which catches a notch in a plate on the back end of the hour socket, and moves the hour hand. All these several parts of a clock, I claim as my own invention.

AARON D. CRANE.

Specification of a patent for Ornamenting the Grounds of Picture, Looking-Glass, and other Ornamental Frames, called "The Jackson Ground." Granted to JOHN PARKER *and* LEWIS P. CLOVER, *New York, March* 23, 1829.

THIS improvement consists in taking the common foundation lace unfigured, or any species or pattern of cotton, thread, silk, or any other lace, figured, or ornamented, or unfigured, or any thin fabric where the figure or texture projects above the surface of such varied sort, or pattern, as the fancy of the artist, or its cheapness, may dictate, and having previously prepared the ordinary picture or other required frame, in the usual plain manner, with a smooth surface, the aforesaid lace, or other fabric, is then sized over with glue, or any other substance which will cause it to adhere to the frame; it is placed on the aforesaid smooth surface of the frame intended to be ornamented, and after the same has firmly adhered to said frame, it is gilded over, or silvered, painted, or bronzed, in the usual manner of gilding, silvering, painting, or bronzing of frames.

The value of the improvement consists in the saving of labour and expense in the production of an ornamented surface to frames, and in the beautiful figure in the fabric, and figure of the lace, or other fabric, being thus transferred to, and becoming an ornament on the surface of the frame, and also in being a more expeditious method of ornamenting a surface to be gilt, than moulding, or casting, as now practised. This improvement may also be applied to the surface of any article of useful or ornamental furniture where the surface requires to be ornamented.

JOHN PARKER.
LEWIS P. CLOVER.

Remarks by the Editor.—There has been deposited in the patent office a specimen of one of the frames ornamented in the manner above described. Bobbin-net, or other lace of a similar texture, has been affixed so as to cover the hollow of a bold wide picture frame; and the gilding laid upon this, produces a very beautiful effect, and one which it would be extremely difficult, if not impossible, to imitate, by any other process. We have seen but few things of a character equally simple and pleasing.

Specification of a patent for an improved Salt Pan, for boiling Salt Water, for the manufacturing of Salt. Granted to WILLIAM BLOCKSOM *and* J. T. FRACKER, *Zanesville, Muskingum county, Ohio, March* 23, 1829.

BE it known that we, the said William Blocksom and John T. Fracker, have invented a new and useful salt pan, for the purpose of boiling salt water in manufacturing salt, specified in the words following.

This pan consists of a number of parts of cast-iron of a suitable thickness, say five-eighths of an inch, two feet long, four feet wide, and fourteen inches deep, or these dimensions may be greater or less, the bottom and sides forming a semi-ellipsis with flanches projecting inwards at right angles from the bottom and sides, half an inch thick, and two inches wide, through which, holes half an inch in diameter and about six inches apart, are drilled to admit screw bolts; the parts are to be put together and the seam cemented, the ends enclosed by a plate of cast-iron, through which holes are drilled corresponding with those in the flanches, and secured in the same manner as the other parts; by using fewer or more parts, the pan can be made to any length to suit the manufacturer.

The mode of using this pan in manufacturing salt, is, first to build two stone walls parallel to each other, of a proper length, height, and distance apart, to receive the pan, on the top of which the pan is to be set; this forms a furnace, at one end of which a chimney is built for the purpose of creating a current of air through the furnace; at the other end of the furnace the fire is applied to heat the pan for boiling the salt water.

What we claim as our invention and improvement, is, the bottom and sides being elliptical, or circular, which gives the metal an opportunity of contracting and expanding, without breaking.

WILLIAM BLOCKSOM.
JOHN T. FRACKER.

Specification of a patent for the Cure of Crooked, or Inflected Spine, in the Human Body, consisting of various instruments, to be called the "Dormant Balance." Granted to JAMES K. CASEY, ESQ., *of New York. First issued, June 23d,* 1828, *afterwards surrendered for the purpose of amending some defects in the specification, and re-issued, January 21st,* 1829.

(WITH A COPPER-PLATE.)

THIS machine consists of a plane frame, the flat surface of which is about the size of a common mattress, and upon the longer edges of which, gudgeons, or centres, are fixed, at or near its centre of gravity. These gudgeons, or centres, are received into proper boxes, or bearings, on fixed supporters, the height of which a little exceeds the length of the frame. The frame, therefore, can revolve upon its gudgeons, or centres, as about an axis passing through it in the direction of its breadth. Upon the top of this frame, there is a bracket, from which is suspended, by a cord passing over a pulley, braces, and bandages, to be attached to the head of the patient.

The whole apparatus is shown in the annexed drawing and explanation.

The mode of operating with this apparatus, is as follows. The frame being brought into a vertical position, or nearly so, upon its

gudgeons, the patient is made to stand with his back against the side of the frame. The braces and bandages are then attached to his head, which is then drawn upwards by the cord passing over the pulley. By the direct gravitation of the lower part of the body, acting in opposition to the force by which the head is drawn upwards, the body is extended and the spine straightened. The force to be applied by the cord, must be varied according to the circumstances of the case; commonly about fifty pounds are required. After this extension has been continued from five to thirty minutes, the frame should be turned gently upon its axis, bringing the patient to a horizontal, or nearly horizontal, position, with the frame under and supporting him, the frame being kept in place by horses, chairs, or any proper supporters. The bandages are then to be removed from the head, and in this position the patient should remain an hour, or more, as may be convenient.

When the patient intends to remain long in the horizontal position, it will be necessary, previously to turning the frame as before described, to interpose between it and the patient, a mattress or other soft body. The foregoing operation should be repeated from day to day, twice or three times a day, until the distortion disappears.

In the preceding specification I have, for the purpose of making the application of my improvement more clearly understood, described with it certain instruments and parts which do not belong to this invention. Therefore, I hereby declare my invention, for which I claim letters patent, to consist in the combination and arrangement of the moveable frame with its supporters, and in making the braces and bandages to correspond with the motion of the head and the exercise of the arms and body, and thus, without danger or exposure to accident, providing for making an extension of the spine, when the patient is in a standing position; by which the extending force is counteracted by the whole weight of the body; and also providing for changing the position of the patient, from standing to recumbent, without removing him from the machine. JAMES K. CASEY.

Explanation of the Plate.

Figures 1 and 2 represent different positions of the apparatus, which can also be readily placed horizontally, in which case tressels, or horses, may be placed under the ends of the frame.

A, the moveable frame, suspended by

B, B, the gudgeons.

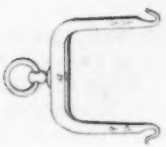
C, C, the supporters.

a, b, c, braces and bandages to be applied as shown in the drawing, which also exhibits the manner in which the pulley acts.

Remarks by the Editor.—In our list of patents for June last, we noticed this invention, and subsequently published the original specification. The patentee soon found that this specification was defective; he, therefore, surrendered his patent, which was re-issued with the foregoing description.

In our previous notices of Mr. Casey's apparatus, we have spoken

PLATE IX.



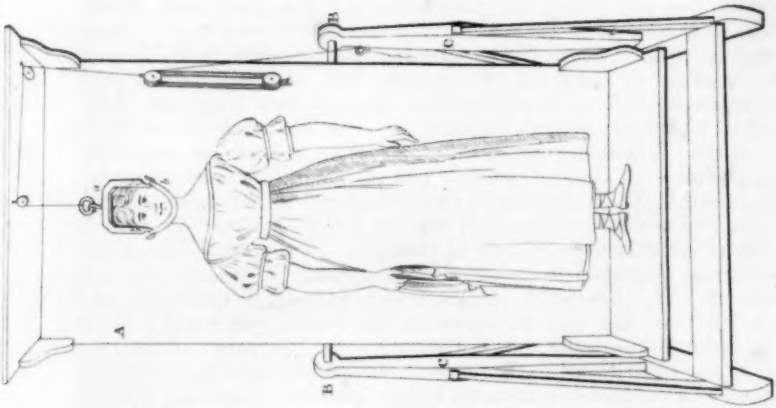


Fig. 1.

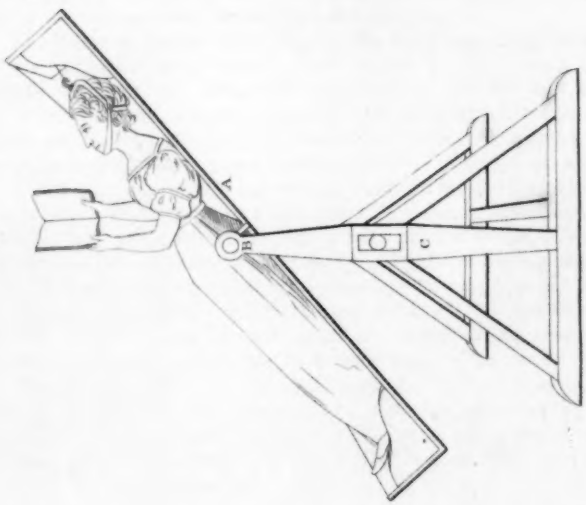


Fig. 2.

of it in very favourable terms. The opinion which we entertained, received a very powerful support from the unqualified terms of approbation in which a very distinguished physiologist had expressed his conviction of its value; our intimate acquaintance with the individual to whom we referred, justified the confidence with which his judgment was received. Since that period, the instrument has been applied in a number of cases with the most perfect success.

We with pleasure enter more into detail respecting this apparatus than we usually do with patents, because we feel that the subject is one of great interest in itself, and more particularly so, as it relates to the cure of a complaint, the sufferers from which are numerous, and to which those whom nature has cast in her finest mould, are the most frequently subjected. We believe that the patentee has supplied what was, until now, a great desideratum in medical mechanics. With the inventor we have no personal acquaintance, and in the invention we have no interest but that of humanity. We have corresponded with Mr. Casey, and with others, upon the subject, and we are authorized to say that doctors Cheesman, D. W. Kissam, jr., D. Kay, and George Wilks, of New York, who professionally visited the British isles, and the continent of Europe, have awarded to Mr. Casey's method of treatment, a character of decided superiority over any thing which they have elsewhere witnessed. We are also assured that every practitioner of eminence who has carefully examined its operation, has concurred in the same opinion; and are informed that upon this united testimony, Dr. John B. Ogden, of New York, a gentleman of talents, and of the most respectable connexions, has taken the apparatus to Europe.

The late deeply and justly lamented Dr. King, son of the Hon. Rufus King, pronounced the Dormant Balance the *only* machine which, in his judgment, could effect a cure; as, by it, the power which is necessary to accomplish the object, *permanently*, may be applied, with perfect ease and security to the patient.

We deem it unnecessary to give the very long array of the names of distinguished practitioners with which we have been furnished, whose opinions are altogether approbatory, but we add an extract of a letter to Mr. Casey, from the pen of a very learned and reputable physician in Boston, who has distinguished himself by his physiological disquisitions in a valuable journal of which he is the editor.

"My opinion, as you are aware, must be founded partly upon the knowledge which I have of the cases in which it has been employed, and partly upon general reasoning with regard to the effect of such an application upon the human body. Without having seen a single case, I should have judged that your apparatus, if made use of for a sufficient length of time, and upon a person not too far advanced in life, would generally effect a cure. After having seen it applied in two cases repeatedly, and in a third once, I am ready to say that the *immediate* influence exerted upon the curved spine, is greater than I should have anticipated; and that the *permanent* change produced in the *shape* and *height*, is such, even after the short period during which the machine has been applied, as fully to confirm the

opinions I had formed. In short, all that I have seen and known, leads me to believe that your method is superior to any known, and that, if persevered in, with the use of the proper means for preserving and improving the general health, it will prove successful in all but the most aggravated cases."

Mr. Casey has used his apparatus extensively in the cities of New York and Boston, and is now in Philadelphia. He is accompanied by his lady, who attends to those patients who prefer the aid, and require the instructions, of one of their own sex.

In publishing patents for things appertaining to the healing art, we rarely feel any sensation but that of disgust at the facility with which quacks impose their nostrums upon the community, and increase the evils which they propose to cure; but in cases like the present, the instruments speak for themselves, and the judgment, not the credulity, is addressed.

Observations on the Inclined Plane, the Wedge, and the Screw, as Mechanical Powers. *By* D. H. Mason, Mechanician.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

Sir,—Scientific gentlemen in their lectures and treatises on mechanics, and mechanicians in general, have considered the inclined plane, wedge, and screw, to be very nearly allied, if not identical in principle, promiscuously calling them by their different names; as this opinion appears to me incorrect, I am induced to offer the following remarks for publication in your Journal.

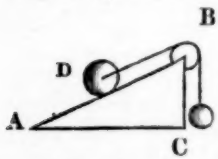
Yours, &c.

D. H. Mason.

It may be proper to offer in the commencement of my remarks, what may be considered a correct definition of the inclined plane and wedge.

The inclined plane is merely a plane surface, inclined to the horizon, and is used to raise weights from one level to another.

The power required to sustain a weight on an inclined plane, is in the same proportion to the weight, as the perpendicular height is to the length of the inclined surface.



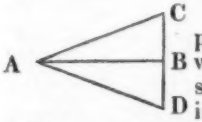
Let the hypothenuse A, B, represent the weight D, then the perpendicular C, B, will represent the power E, sufficient to sustain the weight on the plane. And the base A, C, will represent the pressure of the weight D, on the plane.

These proportions will invariably hold good in all inclinations of the plane. The power to raise a weight on an inclined plane, should always act in the direction of the plane, otherwise it is a compound machine, partaking in part of the principles of the wedge.

The wedge is a triangular piece of metal, wood, or other substance, and is used to separate bodies.

The power and resistance are in the same proportion as the base and perpendicular; or in a double wedge, as the length through the centre, and half of the back.

Let the base A, B, represent the resistance, the perpendicular B, C, will represent a power sufficient to sustain the resistance, so that the power and resistance will be in equilibrio.



Or in a double wedge, let the centre A, B, represent the resistance, then half the back C, B, will represent a power sufficient to sustain the resistance, so that the power and resistance will be in equilibrio.

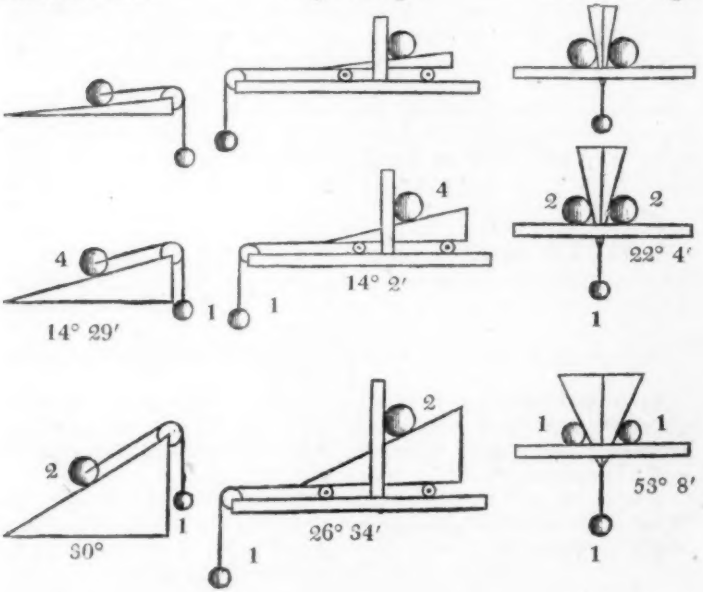
These proportions will invariably hold good, in all angles of the wedge.

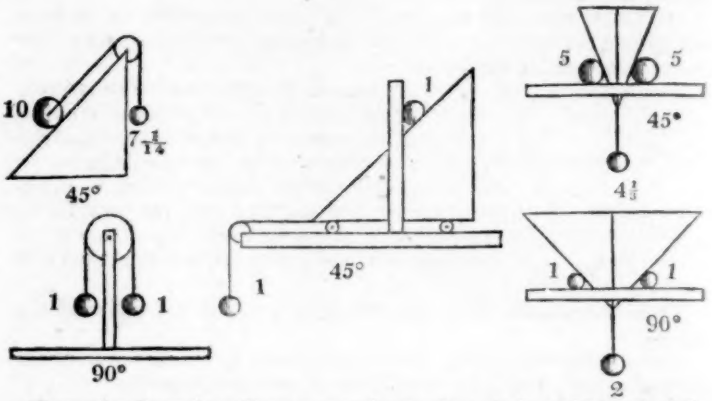
In the wedge, the power should always act in the direction of the base, or centre, otherwise it partakes of oblique pressure.

In all machines, when the resistance is to be overcome, the power must be increased, sufficiently to overcome the friction.

Having premised thus much, I shall give a number of diagrams of the inclined plane and wedge, commencing with a small angle where they may be considered nearly equal, and increasing in the angle, giving the proportions of the power and resistance in each, which will exemplify a vast difference in the two machines.

Inclined Plane. *Single Wedge.* *Double Wedge.*





From the foregoing diagrams and premises, it is evident that the following differences exist in the inclined plane and wedge.

In the inclined plane, the power acts to the greatest advantage, in the direction of the plane.

The power and resistance in the inclined plane, are calculated by the hypothenuse and perpendicular.

In the inclined plane, at an angle of 14 degrees 29 minutes, the power and resistance are as one to four.

In the inclined plane, at an angle of 30 degrees, the power and resistance are as one to two.

In the inclined plane, at an angle of 45 degrees, the power and resistance are nearly as seven and a fourteenth to ten.

The power and resistance are equal in the inclined plane, at an angle of 90 degrees.

In the wedge, the power acts to the greatest advantage, in the direction of the base, or in a line through the centre.

The power and resistance in the wedge, are calculated by the base and perpendicular, or by a line through the centre and half the back.

In the single wedge, at an angle of 14 degrees 2 minutes, and in the double wedge, at an angle of 28 degrees 4 minutes, the power and resistance are as one to four.

In the single wedge, at an angle of 26 degrees 34 minutes, and in the double wedge, at an angle of 53 degrees 8 minutes, the power and resistance are as one to two.

In the double wedge, at an angle of 45 degrees, the power and resistance are nearly as four and one-third to ten.

The power and resistance are equal, in the single wedge, at an angle of 45 degrees, and in the double wedge at an angle of 90 degrees.

The inclined plane can never exceed 90 degrees.

The single wedge may be made nearly to an angle of 90 degrees, and the double wedge nearly to an angle of 180 degrees.

In the inclined plane, the power can never exceed the resistance.

In the single wedge, having an angle greater than forty-five degrees, and in the double wedge, having an angle greater than ninety degrees, the power will always exceed the resistance, therefore it may be denominated an inverted wedge.

The following are legitimate conclusions from the foregoing.

The inclined plane and wedge are distinct mechanical powers.

The single wedge is the most simple form, as the double wedge is two single ones together.

The double wedge may always be calculated as to the proportions of power and resistance, as a single wedge having half the angle of the double one.

The inclined plane and wedge proceed in different ratios of angle, from a small to a greater, for the same power.

The Screw.—The screw may be denominated a spiral wedge, and in all its applications never acts as an inclined plane, which will be evident on considering the laws of the plane and wedge, as stated above; the method of calculating the power and resistance, is also the same as the wedge; one circumference of the screw gives the base, and the distance from the centre of one trait, or thread, to another, gives the perpendicular.

The screw, however, must be considered as a compound machine, being in almost all its applications necessarily turned by a lever, which must be taken into account in calculating its power, in which case the distance the end of the lever (where the power is applied) passes in one revolution gives the base, and the distance from the centre of one trait to another gives the perpendicular. And further, the screw is always used double, having a counter screw, or that which is equivalent to it, as the teeth of a wheel in a tangent screw.

This statement respecting the screw, is not meant to exclude the existence of a spiral inclined plane, such as the representation of the Tower of Babel, or an ascending road round a hill or mountain, which differ materially from the screw, in the calculation of the power and resistance, having no resemblance to it but its spiral form.

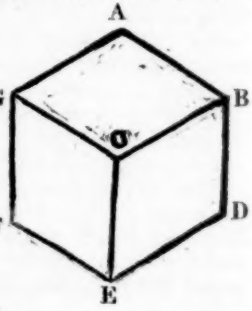
Notice respecting Professor Farish's Isometrical Perspective. By the Editor.

Professor Farish, of the University of Cambridge, in England, has introduced a new mode of drawing in perspective, which is peculiarly applicable to the delineation of machinery, as the proximate and the most distant parts of the thing represented which lie in the

same plane, are all drawn to the same scale. The designation "*Isometrical*," was given to it by its inventor, to express this fact, as it signifies *to the same measure.* The great peculiarity in this mode of drawing in perspective, is, that there is no vanishing point; or, what is the same thing, the vanishing point may be considered as at an indefinite distance from the object. Perhaps a clear idea of the principle upon which such a representation depends, may be obtained by supposing a telescopic view of a single and distant object to be delineated. Let a carriage, for example, be placed at the distance of a mile from the observer, and that to obtain a distinct view of it, he looks at it through a telescope. From a point of sight so distant, every part seen in the same plane, will, as to sense, appear *Isometrical*, and the scale which would measure the nearer, would also measure the more distant wheels.

We are not aware that, in this country, this kind of perspective has been employed previously to the adoption of it by Mr. Howard in the representation of his rail-way carriage, Fig. 4th, Plate 8th, of this volume.

To give an exact representation of the proportionate dimensions of a machine, it has been common to exhibit it orthographically in its three principal directions, one on the horizontal plane, and two on vertical planes, at right angles with each other. This mode may be seen by referring to Figs. 1 and 2, Plate 7, and Fig. 1, Plate the 8th. In the drawing, Fig. 4th, the view of the carriage is supposed to be taken on the same horizontal plane on which it stands, and all the parts on the two vertical planes, are, consequently, *Isometrical.* If we suppose the eye of the observer to be elevated, so that a line drawn from it would meet the horizontal plane, and the planes of the vertical sections in the same angle, all the lines in these three principal directions would become *Isometrical.* Such a line professor Farish denominates the *line of sight.* To those who possess a knowledge of geometry, the representation of the cube in the margin, will give a perfect exposition of what is intended. The *line of sight* would pass through the angle C, and the centre of the cube, and the lines bounding all its planes would be *Isometrical;* and every angle measured at A, B, C, D, E, F, or G, would be either one of 60 or of 120°.



We hope that we have given a clear and popular account of this mode of drawing. Those who wish to examine it more at large, may do so by consulting a full analysis of it in Gregory's "Mathematics for Practical Men," which contains the author's own paper upon the subject, transcribed from the Transactions of the Cambridge Philosophical Society.

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